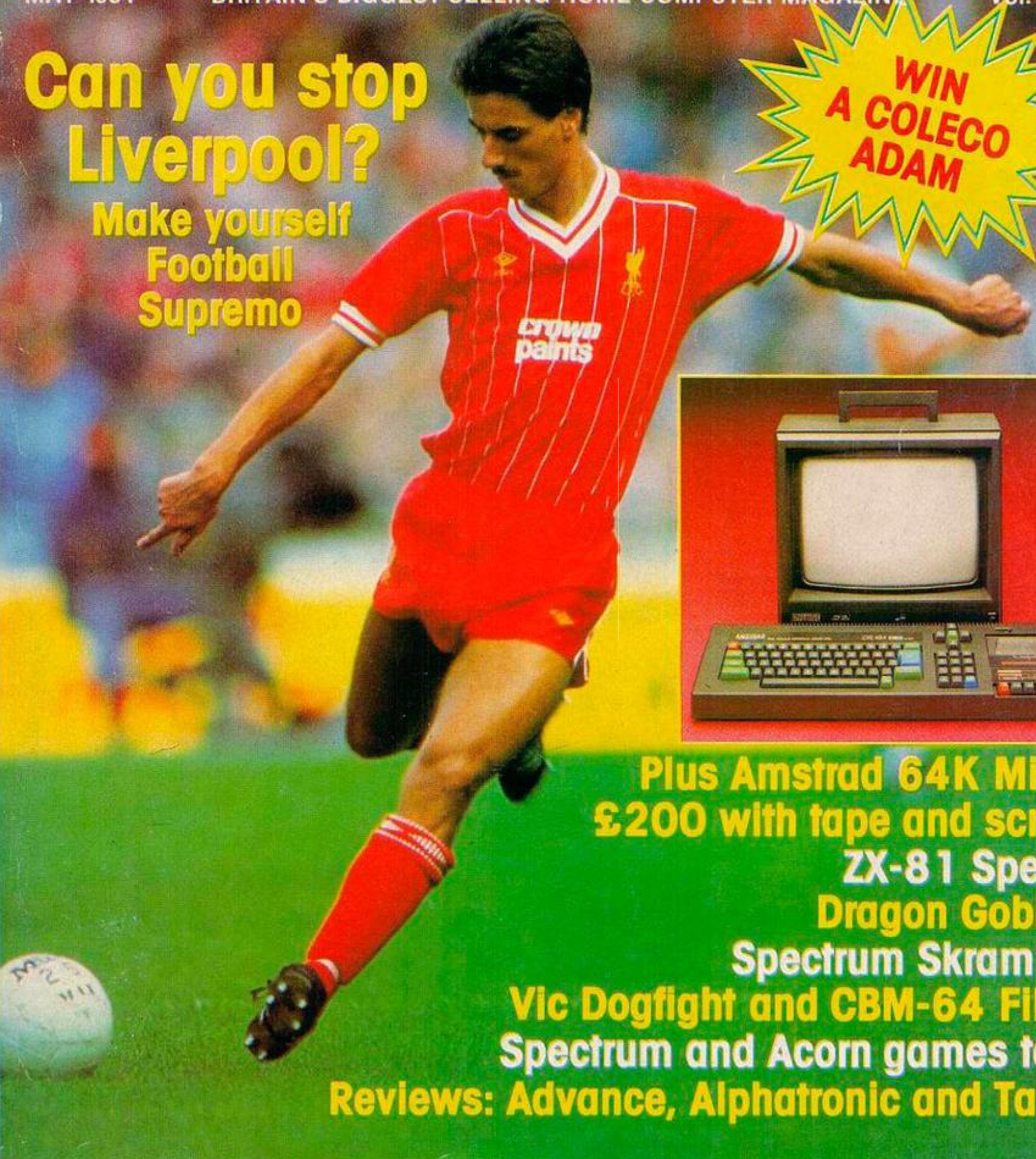
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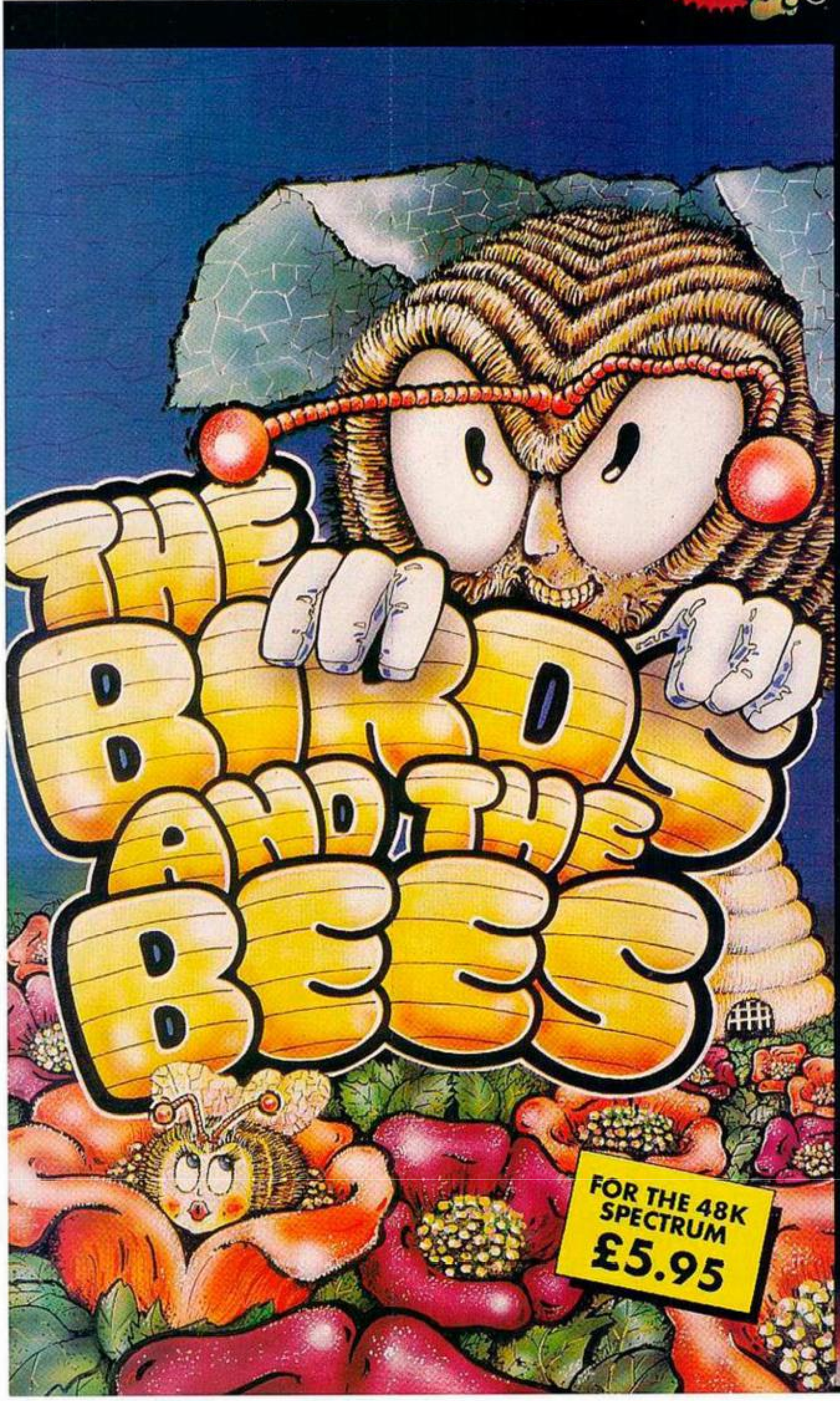
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Author: Adrian Sherwin with graphics by Matthew Smith (of Manic Miner fame)

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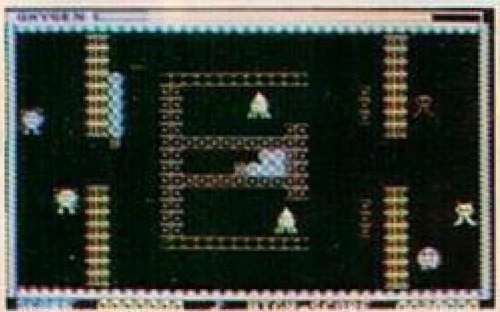
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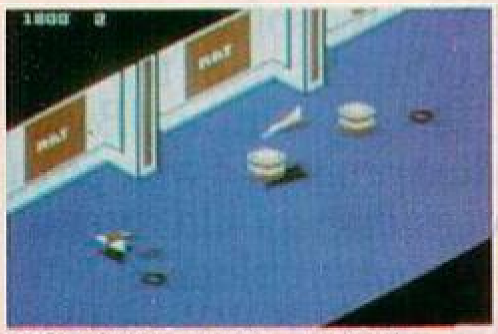
MAY 1984


Software shortlist — page 55.


Football supremo — page 60.


Advance review — page 66.


Amstrad preview — page 69.


BBC software survey — page 78.

EUREK

A 100k BBC-drive for £99 + VAT

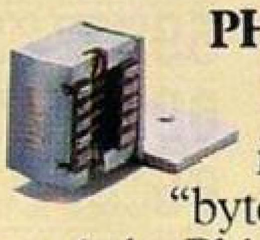
We've done it! We've built a mass storage system for your BBC Micro with the power and convenience of a floppy disk drive, but at a fraction the price. Get to know PHLOOPY, the remarkable new 100k drive that costs only £99 plus VAT, and a further £26 plus VAT for the interface to your BBC, operating system and connecting cables.

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PHLOOPY's special secret



The heart of the invention is a brilliantly designed "byte-wide" magnetic head, made by Phi Magnetronics who build multi-track heads for professional use. PHLOOPY's head records and reads nine tracks across the width of a quarter-inch tape. That means the tape loop can be much shorter, so the typical time to access a file is reduced to a mere 3 seconds. If you're used to waiting for a cassette tape to trundle programs into your BBC, you'll be amazed at PHLOOPY's performance.

Getting it right every time

In addition, we've included a feature we know you will appreciate. PHLOOPY has full error detection and correction, so you can be certain you will get back what was originally written onto the tape.

Talking to your PHLOOPY

PHLOOPY's own software, contained in ROM, responds to standard BBC filing system and Basic commands. Most programs written to run on disk or cassette should run on PHLOOPY without problem.

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little load on the BBC and uses much less RAM than most disk systems.

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You'll be amazed how simple it is to install PHLOOPY. Just plug in the interface cut two resistors (clearly marked in the instructions) and the job is done. If you should have problems our engineers are waiting to help you.

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PHLOOPY cartridges hold a full 100k of data or programs. Two of them come free with the drive and extra ones cost £3.75 each plus VAT. They are moulded of high impact polymers for protection and store easily on a bookshelf. Many programs will be available to purchase on PHLOOPY.



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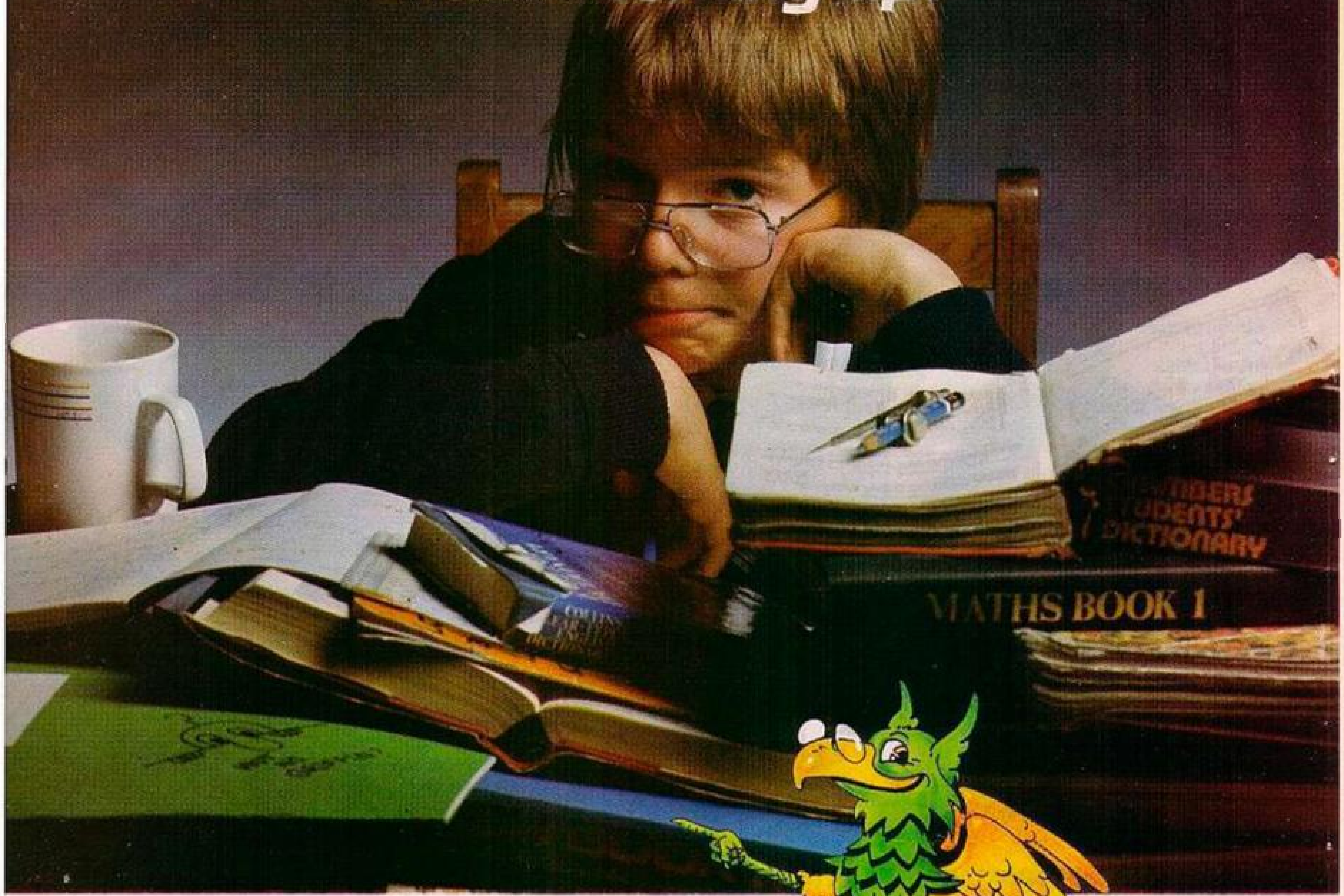
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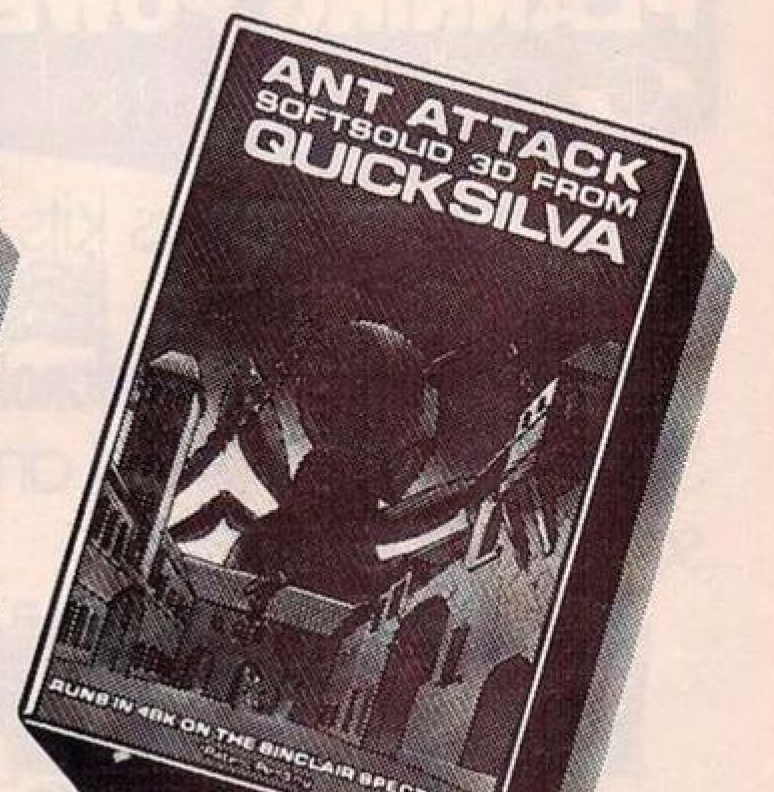


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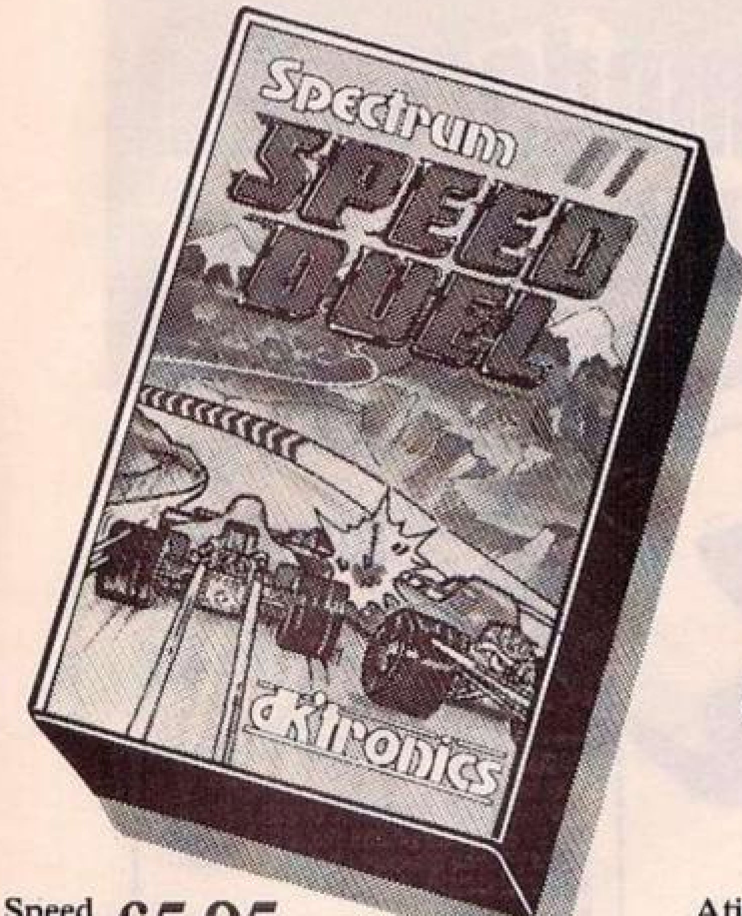
Thousands of Spectrum

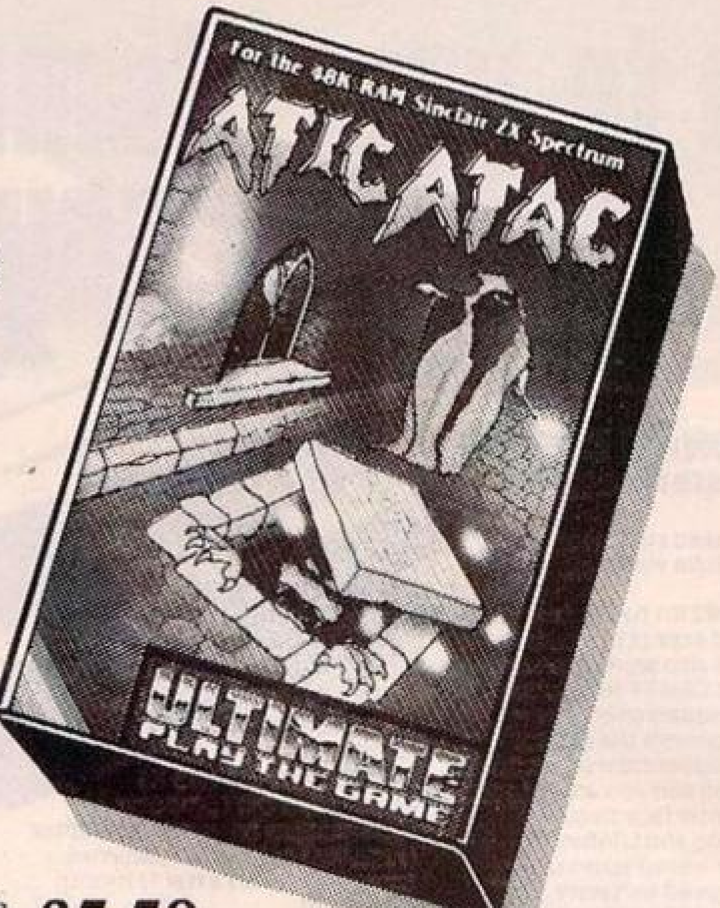


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ENHANCED BASIC FOR THE ZX SPECTRUM 16/48K
26 NEW KEYWORDS — 10 NEW FUNCTIONS — MANY EXTRA FEATURES

Keywords include:

ALTER	– allows extensive manipulation of the attributes file.
AUTO	– for automatic entry of line numbers.
CLOCK	– controls a digital clock with alarm and alarm-initiated GOSUB facility.
DELETE	– any block of lines.
DO	– DO ... LOOP structure, with WHILE, UNTIL and EXIT IF.
DPOKE	– double POKE.
EDIT	– a specified line number.
ELSE	– used with IF ... THEN.
GET	– waits for keyboard entry; doesn't use ENTER.
KEYWORDS	– shifts between new keywords and normal graphics mode.
ON	– GOSUB or GO TO a line number from a list of line numbers.
ON ERROR	– allows trapping of most reports; has available ERROR, LINE and STAT variables.
POP	– removes data from BASIC's stack.
PROC	– named procedures, with DEF PROC and END PROC.
RENUM	– renumber part or whole program with specified start line and increment. Handles GO TO, GOSUB, ON, etc.
ROLL	– pixel movement of part or whole screen in any direction, with wrap-round.
SCROLL	– as ROLL, but without wrap round.
SORT	– sorts part or all of string or numeric arrays according to specified substring or column. SORT INVERSE sorts in reverse order. One hundred strings can be sorted in about one fifth of a second!
TRACE	– allows display of line and statement numbers as a program is running. Display of selected variables, single stepping, and reduced speed are also possible.
USING	– used with PRINT; formats numbers.

Functions provide:

Conversion between decimal and hexadecimal — conversion between integers and two-character strings (allows "integer arrays") — formatting of numbers — INSTRING and STRING$ equivalents — amount of free memory — double PEEK — current time.

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The MTX Series described; straight from the author's mouth

MANUAL

The first section (of the manual) is a basic tutorial. The grass roots information is here and I could not find any major mistakes. The second part is on Noddy giving a good guide as to how it can be written. . . . The third and fourth sections are on graphics and sound. Both are quite detailed and easy to follow. The fifth section is on how to interface Assembler to Basic.
Personal Computing Today Feb 84.

The provisional manual, which runs to some 250 A4 size pages, has a wealth of detail for the machine-code specialist.
Electronics and Computing Monthly.

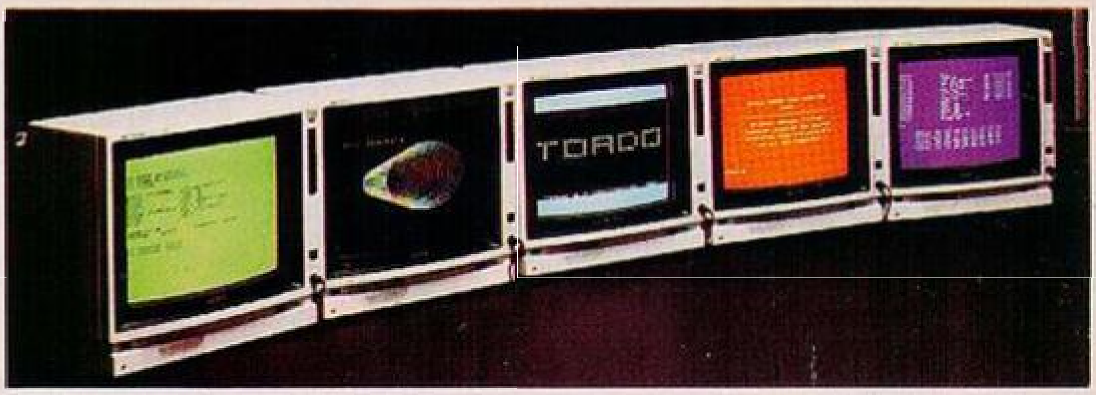
INTEGRATED INTERACTIVE SOFTWARE

The MTX ROM has been designed to allow the maximum interaction between components of the software. A single program can be written which uses NODDY to display text and graphics, and a BASIC control program which calls routines written in assembly code. This is a feature of future generation computers not available on any other micro.

BASIC

The Basic is fast and accurate, all the calculations being done in floating point maths, so that you don't lose accuracy to gain speed.
Personal Computing Today Feb 84.

The latest addition to the Memotech range DMX80 Matrix Printer – 80 characters per second print speed, eight character formats, dot addressable graphics, **£295.00 including VAT.**



Integrated Software – a five to one advantage. Assembler/Disassembler, High resolution Graphics, Arcade style games, Noddy for easy text handling and Front Panel for testing and debugging machine code.

NODDY

A language new to me called Noddy is included in the MTX which is designed to make text handling easy, especially for beginners.
Hobby Electronics.

Also provided is the easy to use beginner's language (Noddy) and a child oriented learning language Logo.
Practical Computing Dec 83.

(Noddy has only 11 commands) that need to be mastered before some quite complex question-and-answer-type programs can be written.
Your Computer Nov 83.

Noddy 's . . . main use is for displaying text and I can see applications in the computer assisted learning (CAL) field. Writing in Noddy is like a mixture of Logo and Forth.
Personal Computing Today Feb 84.

ASSEMBLER/DISASSEMBLER

The Assembler can be accessed through BASIC. When used in conjunction with the PANEL it enables the programmer to single step through and test machine code programs. This is not new to computing, but it is to a home micro.

As well as being able to modify and disassemble sections of code, you can set break points, examine and alter register values, and even single step through code. I hope other Z80 micro manufacturers (particularly in the Cambridge direction) take note of these debugging aids.
Popular Computing Weekly Nov 83.

The Assembler is called from Basic, and it assembles the code in situ, as part of the Basic listing.
Hobby Electronics.

Z80 BOARD

The MTX Series is a more powerful tool for education than the 6502 because it produces a more powerful assembler, allows the PANEL function to be used, and enables integrated software to be written.

RML's 450Z has a (PANEL) function but that is a computer which costs considerably more than the MTX 500.
Hobby Electronics.

FULLY INTEGRATED AND EXTENDED GRAPHICS

The only aspect of the series where extensions to standard language are allowed is in the most comprehensive and integrated graphics available on a home micro.

32 Sprites are supported either 8 × 8 or 16 × 16. They are easy to use and define and do not use extra memory as in the . . . because they have their own area of RAM.
Personal Computing Today Feb 84.

Graphics are very easy to create and manipulate, even for beginners.
Which Micro Jan 84.





MTX512 plus twin 5 1/4" disc **FDX**. A CP/M based business system – **£1245 inc VAT.**

SOUND

The simplification of the sound commands for ease of programming has in no way compromised the quality of the sound produced.

Sound is of great importance for use in games but on many microcomputers it is inadequate. Not so with the MTX . . .
Your Computer Nov 83.

As well as good graphics capability the MTX boasts the same sound chip as the BBC micro – the Texas 76489. It has three tone channels and one noise channel, and is easily controlled from Basic. Volume and frequency can also be controlled, using a much easier method than the 14 parameters needed by the BBC.
Popular Computing Weekly Nov 83.

The commands are sufficiently complex to enable the computer to be used as a synthesizer.
Electronics and Computing Monthly.

CP/M OPERATING SYSTEM

The Series is designed to run under the CP/M operating system. This is the Disc Filing System used on the vast majority of microcomputers in business. Since a program written on one CP/M machine can be transferred and run on almost any other, this makes available 15,000 CP/M based business programs. The powerful LINK program can give access to any device operating under CP/M. With its excellent software support and because of it's modular nature, the series is a cost-effective and efficient entry to serious business and educational computing.

FULL-TRAVEL KEYBOARD

It has a professional quality keyboard. This and its elegant styling make it suitable for word processing and business use.
Your Computer Nov 83.



Input/Output Monitor, Hi-Fi, Power, TV, Centronics, Cassette Mic and Ear, and two Joystick ports all come as standard; the twin RS232 ports are available as expansions.

HARDWARE

Inside the case is what one comes to expect from Memotech – a very neat PCB that holds all the components including the main chips – namely a Z80A processor and TMS 9929 graphics chips as well as about 30 others.
Popular Computing Weekly Nov 83.

If you are familiar with the ZX81 peripherals that Memotech also make you will know that the company has an eye for good design and does not skimp on materials it uses.
Electronics and Computing Monthly.

NODE RING

MTX computers can operate together without expensive network systems. Units linked via the ring can share software peripherals and communicate with each other. Many other makes of computer can be interfaced with the ring as terminals.

EDUCATIONAL USAGE

There will be many people who have seen a front panel display on the 380Z computer in secondary schools or colleges, and the MTX panel is very similar.
Hobby Electronics.

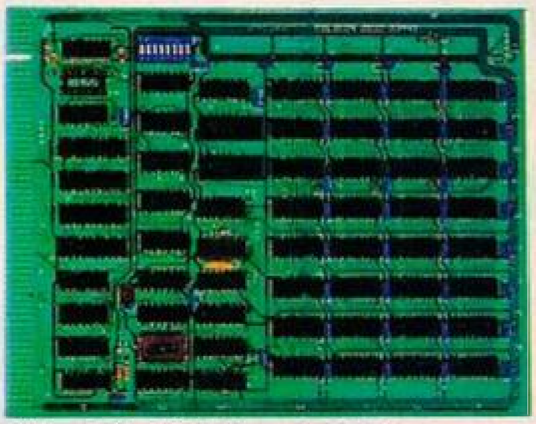
The new language Noddy and the Logo type Turtle Graphic commands would appeal particularly to the growing education market.
Your Computer Nov 83.

Applications are obviously going to suggest themselves in areas of the school curriculum, the fast-training of personnel in commerce, and in adventure-game writing.
Hobby Electronics.

The MTX expansion potential is well thought out. The key to both the MTX Ring system and to the Disc Drive systems is the communications (RS232) board mentioned earlier.
Electronics and Computing Monthly.

UPGRADABILITY

The MTX 500/512 is part of an existing range of products which can be bought separately and integrated into a single powerful system, now.



Silicon Disc RAM Board 256K fast access RAM

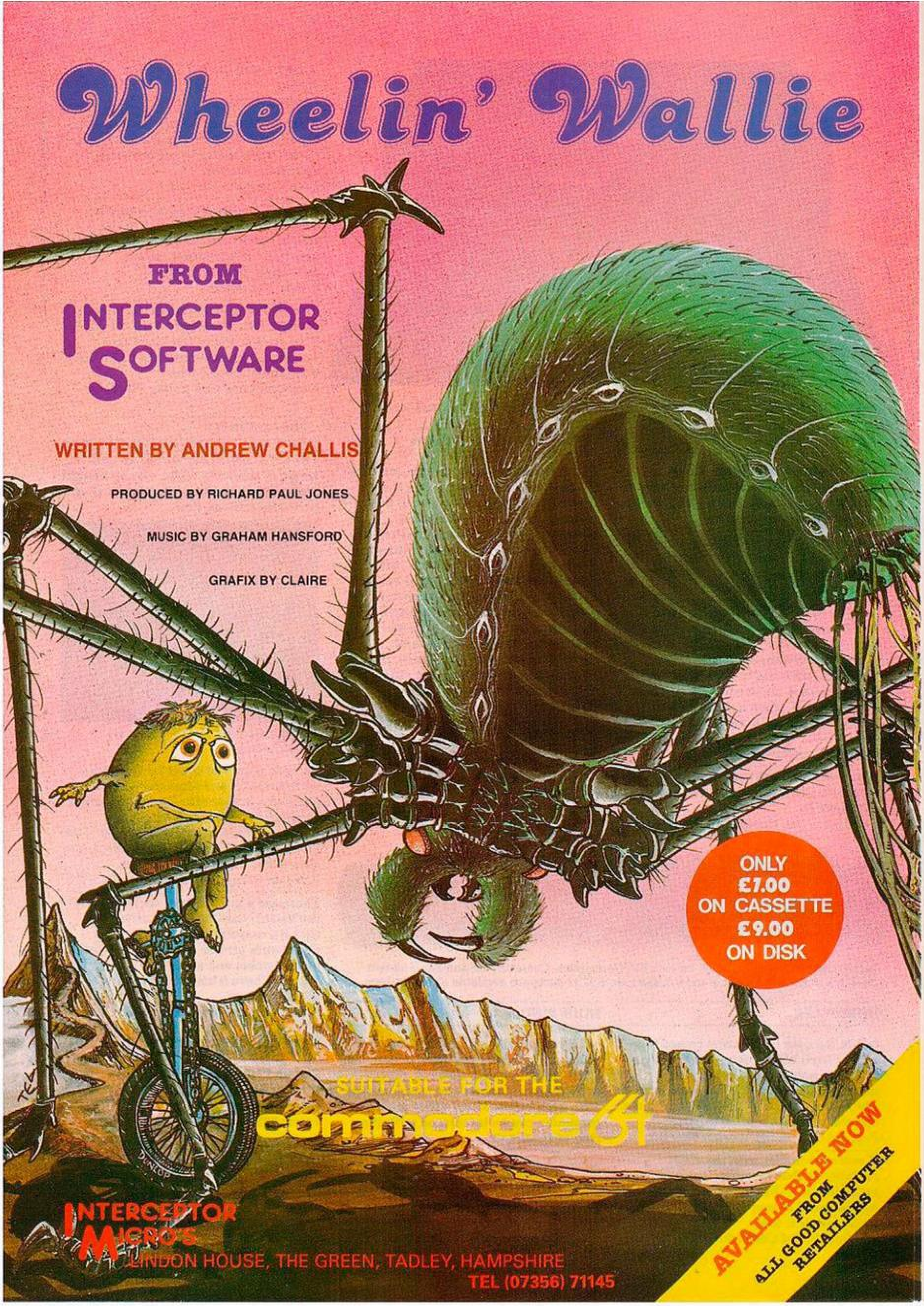
There is plenty of room for expansion with the MTX and Memotech have planned a progression up to their small business machine with 80 column display (instead of the standard 40 × 24) Floppy discs, Silicon (or RAM) discs, and a hard disc under development.
Personal Computing Today Feb 84.

There are a multitude of sockets along the back consisting of two Joystick sockets, cassette connections, Centronics printer circuit, aerial socket, power socket and audio and video output. There is also provision for two RS232 sockets . . .
Popular Computing Weekly Nov 83.

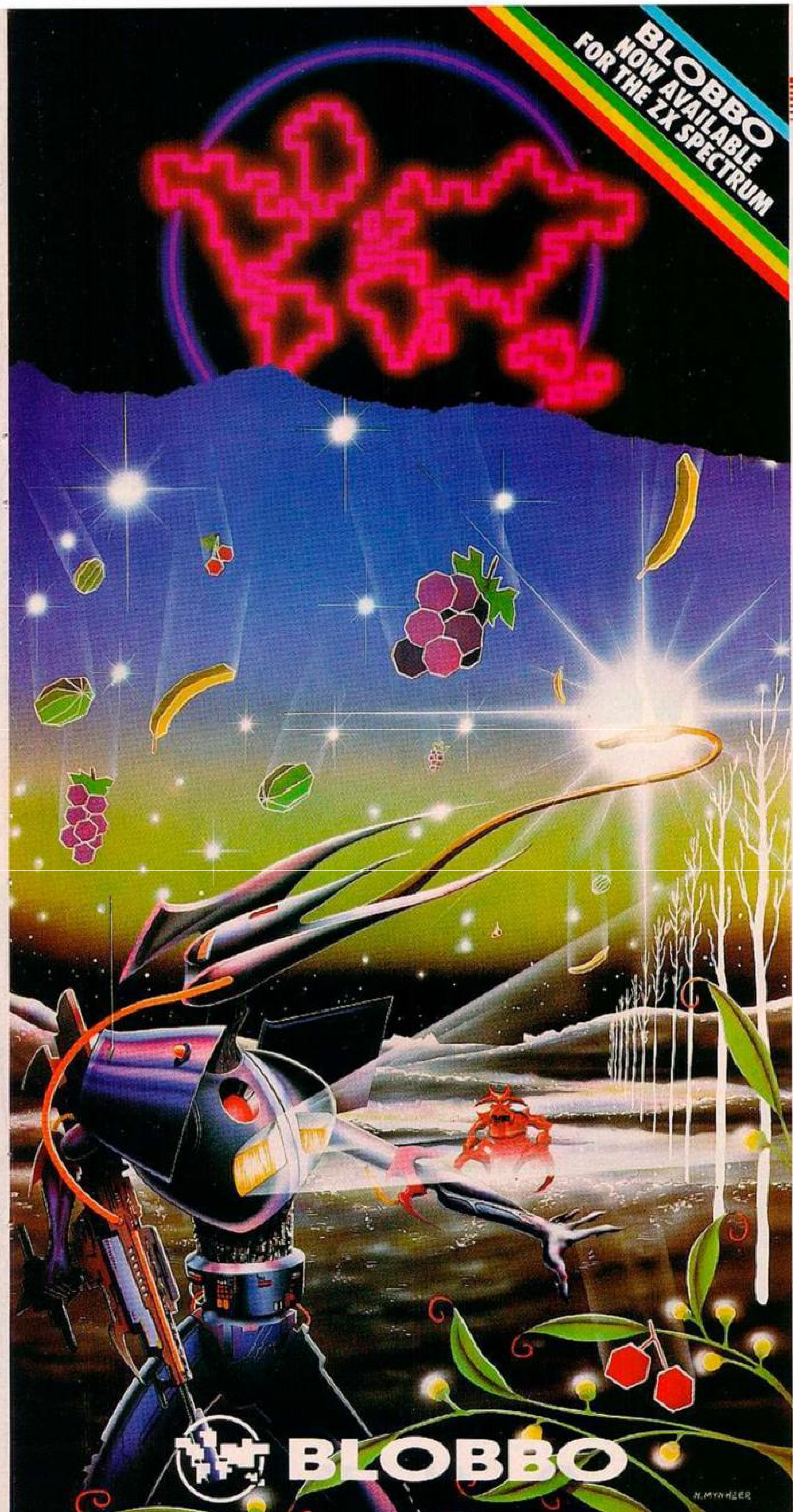
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A fully comprehensive chess package. Ten levels of play, from novice to championship standard. Pitch your wits against the computer with this fast, versatile machine code program.

TOADO

The object of the game is to navigate each of **five toads** across a **road** and **two rivers** without being run down or drowning (toads can't swim).

ALICE IN WONDERLAND

A fully interactive machine code adventure game set in **Wonderland**. You play the part of **Alice**, and explore the fascinating world of Wonderland, full of excitement and suspense. Delve deep into tunnels, caves and wells in search of hidden treasure.

KILOPEDE

Eliminate **mushrooms** and the descending segmented **Kilopede** to gain bonus points — avoid killer **crabs**, **fleas**, **spiders** and **jellyfish** which chase you across multiple levels of increasing difficulty.

SUPER MINEFIELD

The object of the game is to get from one side of the minefield to the other without being **blown up**. You only get one life so be careful — not all the mines are visible. The only way you can tell how many mines are nearby is by looking at the **mine detector** in the top right hand corner of the screen.

BLOBBO

Run at high speed around the maze collecting **treasure** and **fruit** worth bonus points — but don't get caught by the **Blobbo-eaters**! Tactical dodging must be employed to avoid them. If you're caught or step on a skull and crossbones you lose one of your three lives.

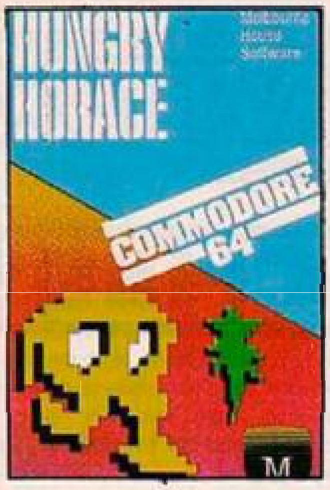
KNUCKLES

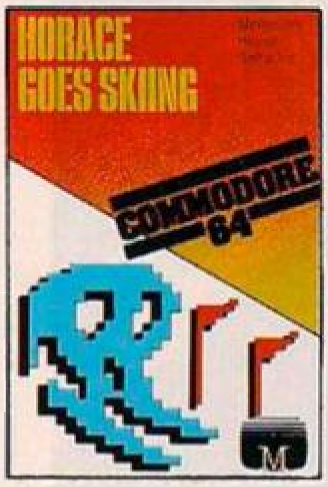
Move **Knuckles** around his maze, using a joystick to kick **Roks** and **Magic Squares**. The object is to line up the Magic Squares, using the fire key, and so advance to the next level, gaining a level bonus.

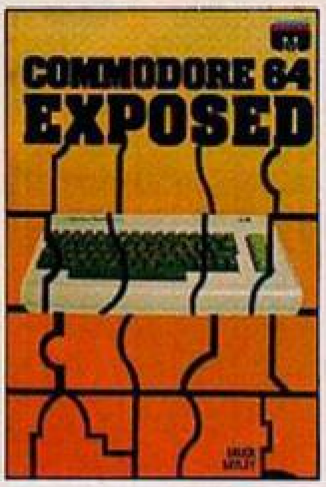
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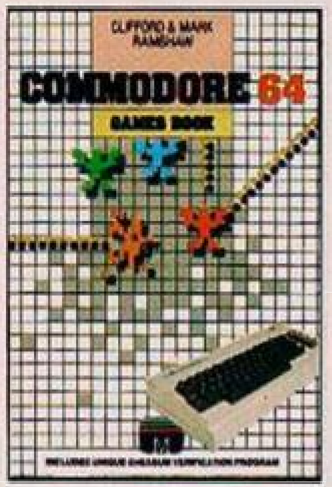
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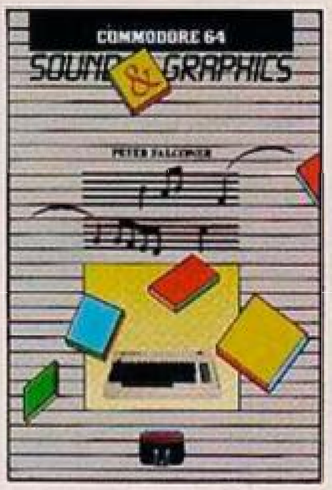
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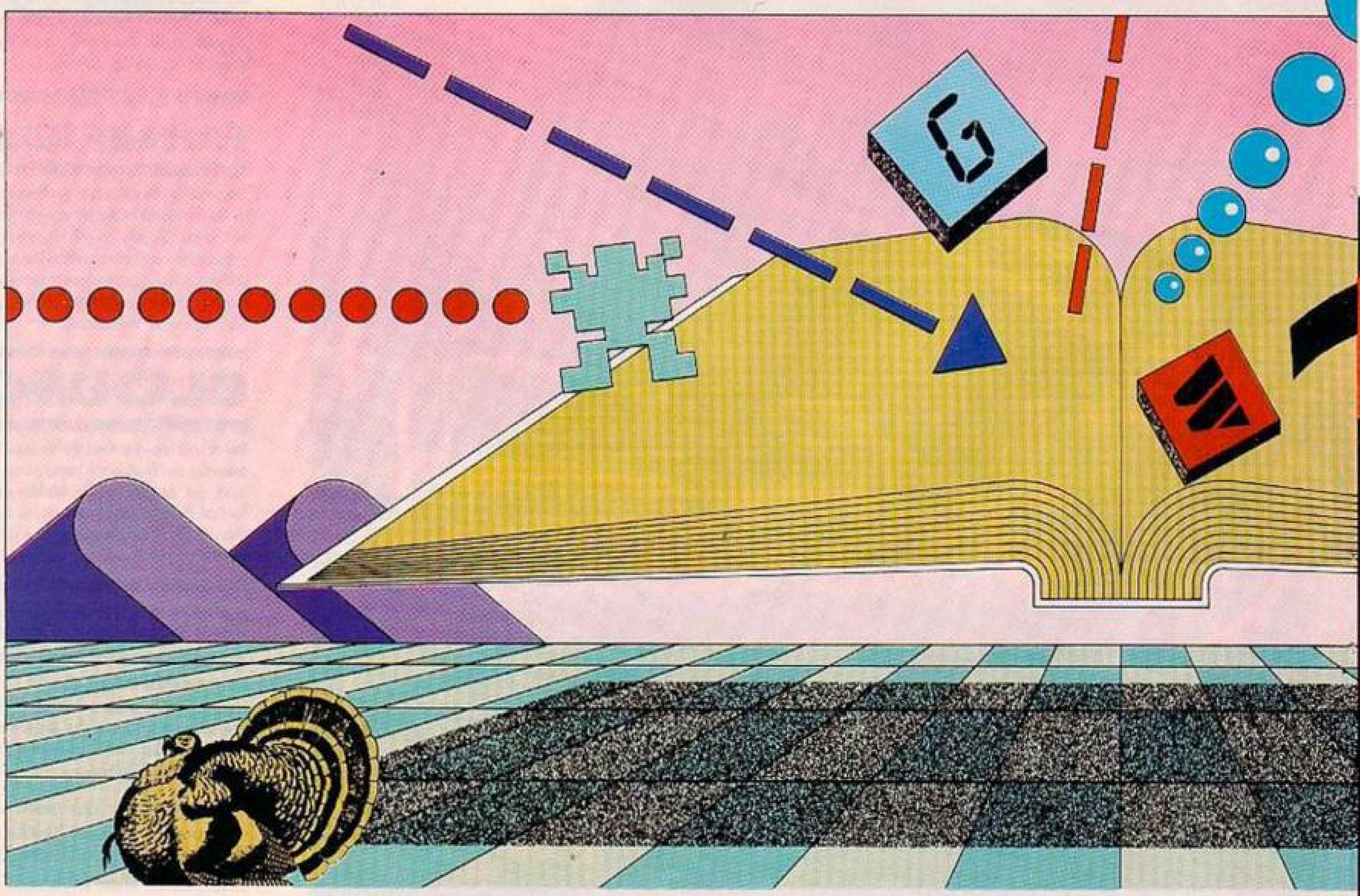
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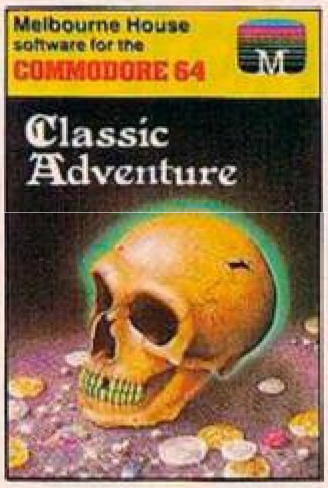
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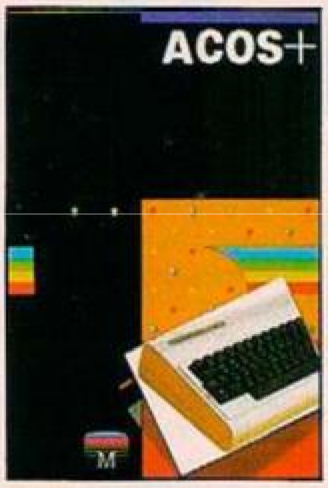
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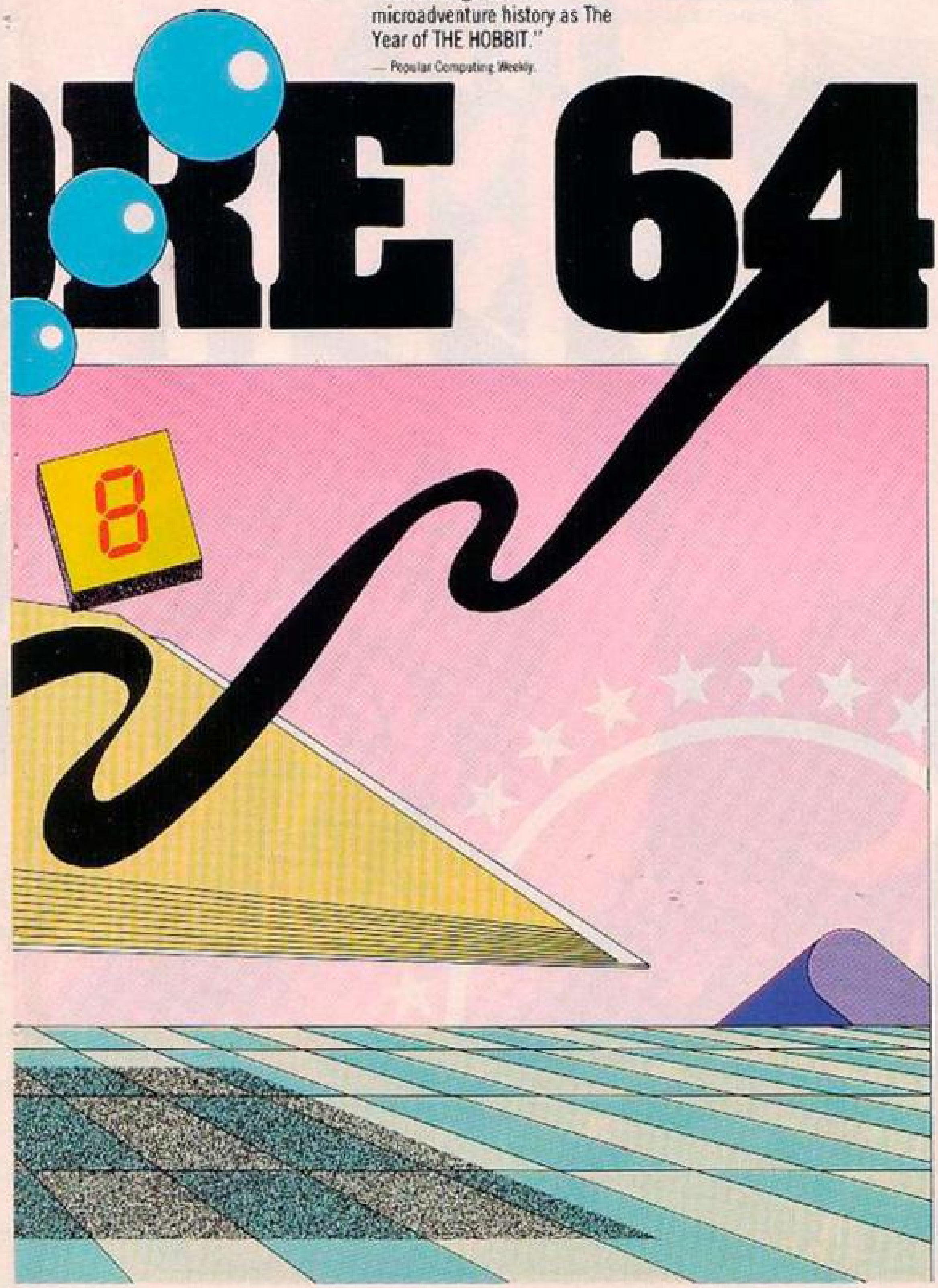
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"Within my circle of friends this game has become something of an obsession. We meet every Friday night at someone's house and spend 3-4 hours on 'The Hobbit'. Friday night would not be the same without 'The Hobbit'."

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"One new Adventure game stands head and shoulders above the rest. It alone almost provides you with a good enough reason to buy a 48K Sinclair Spectrum. Not only does The Hobbit produce drawings of the main scenes, but it also understands proper sentences rather than pairs of words for its commands. It comes with a copy of J.R.R. Tolkien's classic book of the same name. It is the program with the most detailed and best written documentation ever."

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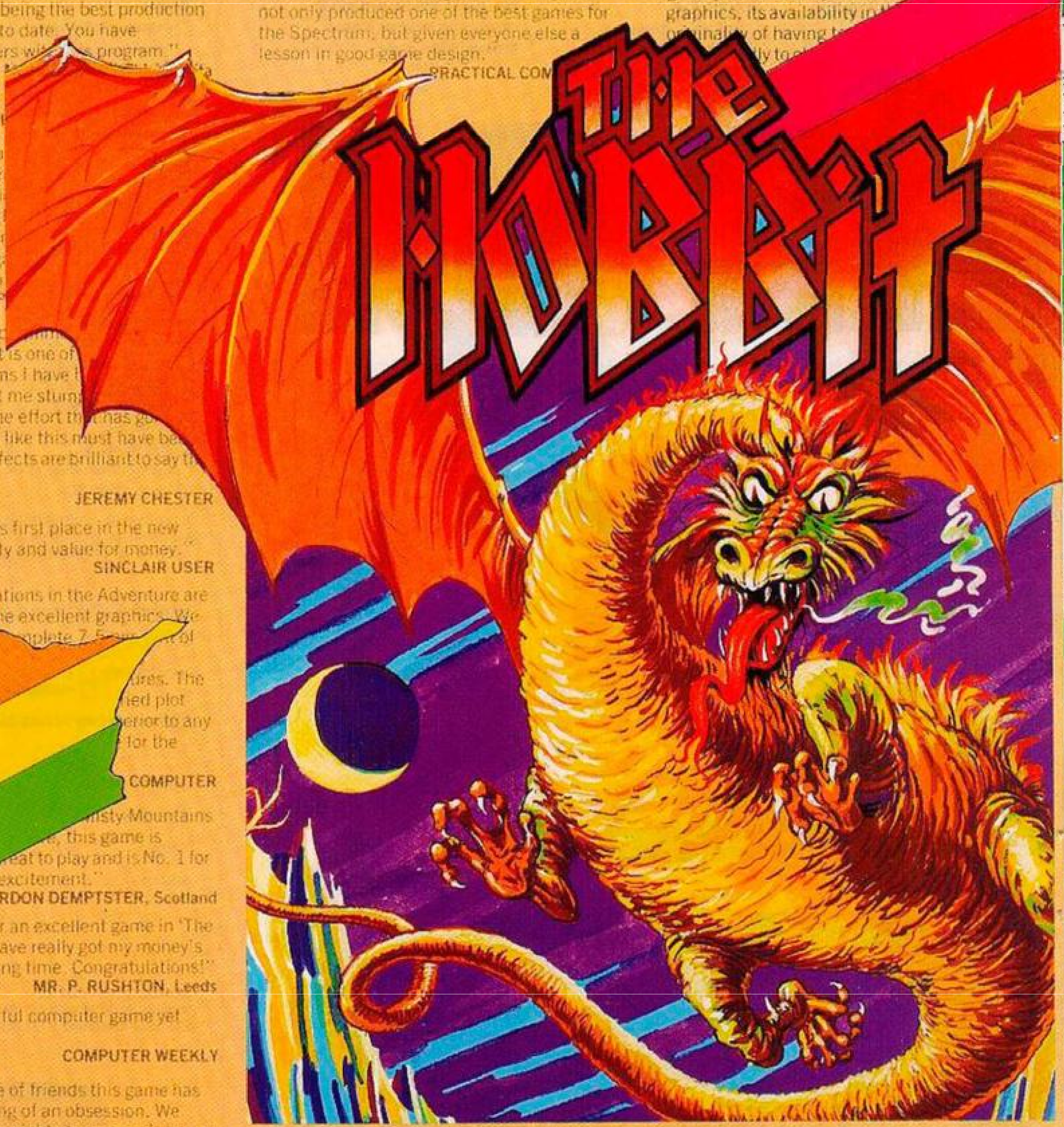
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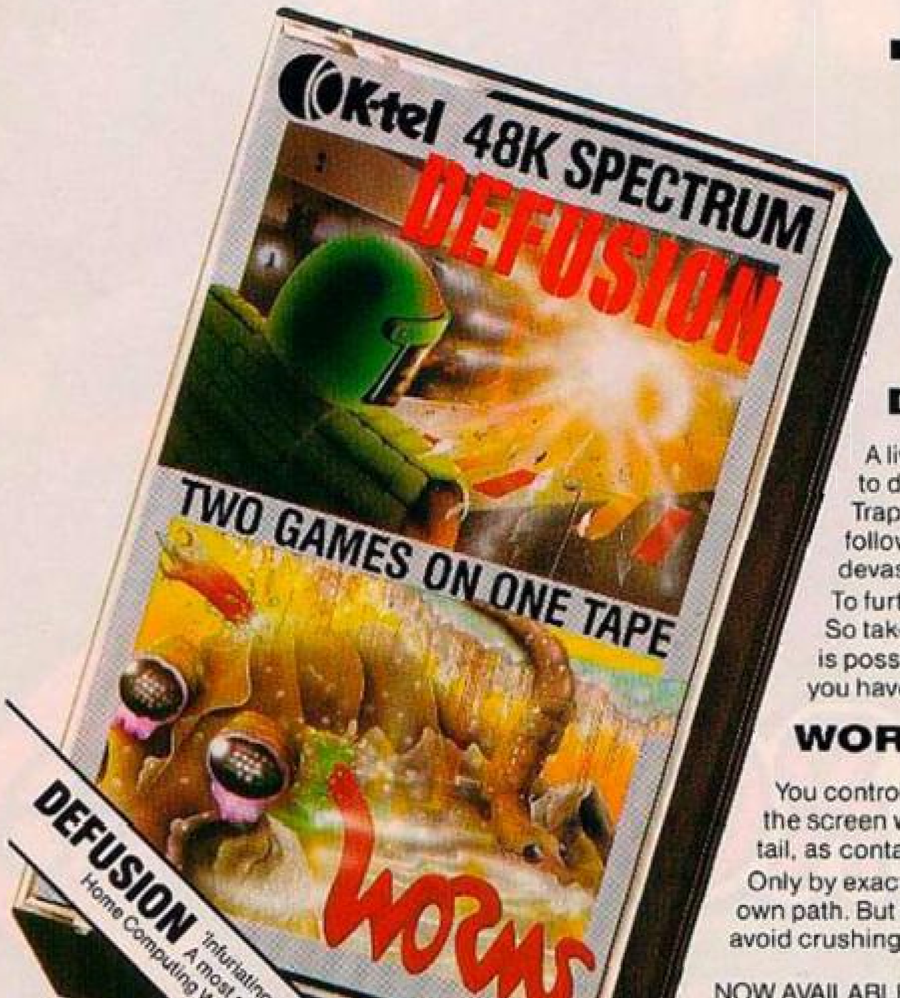
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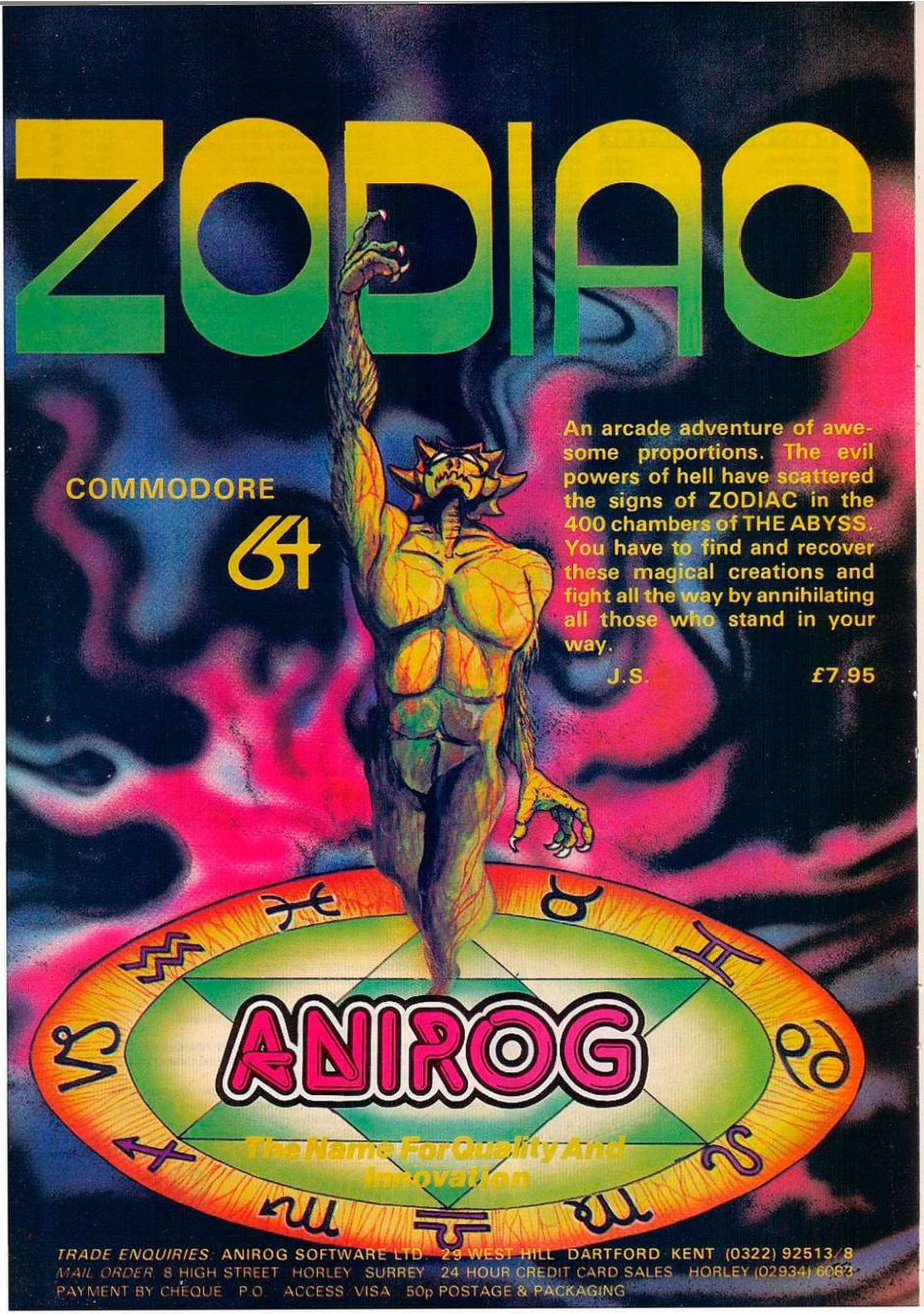
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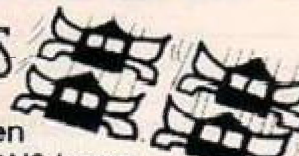
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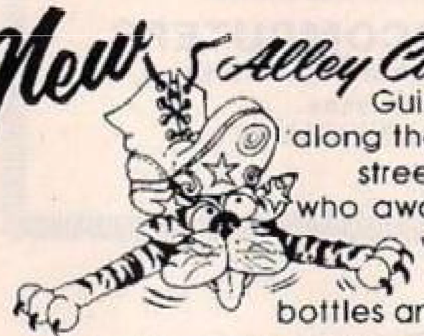


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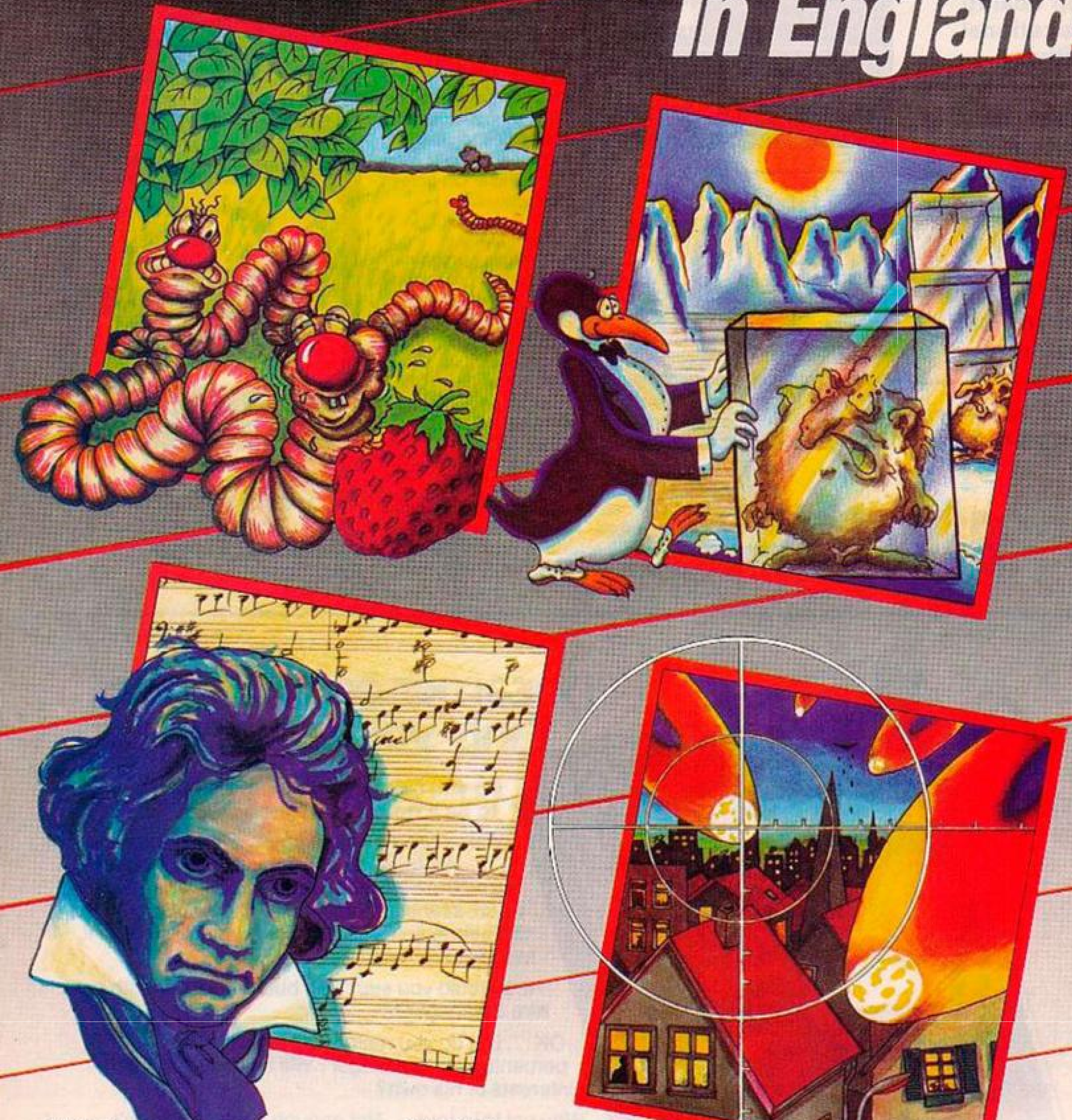
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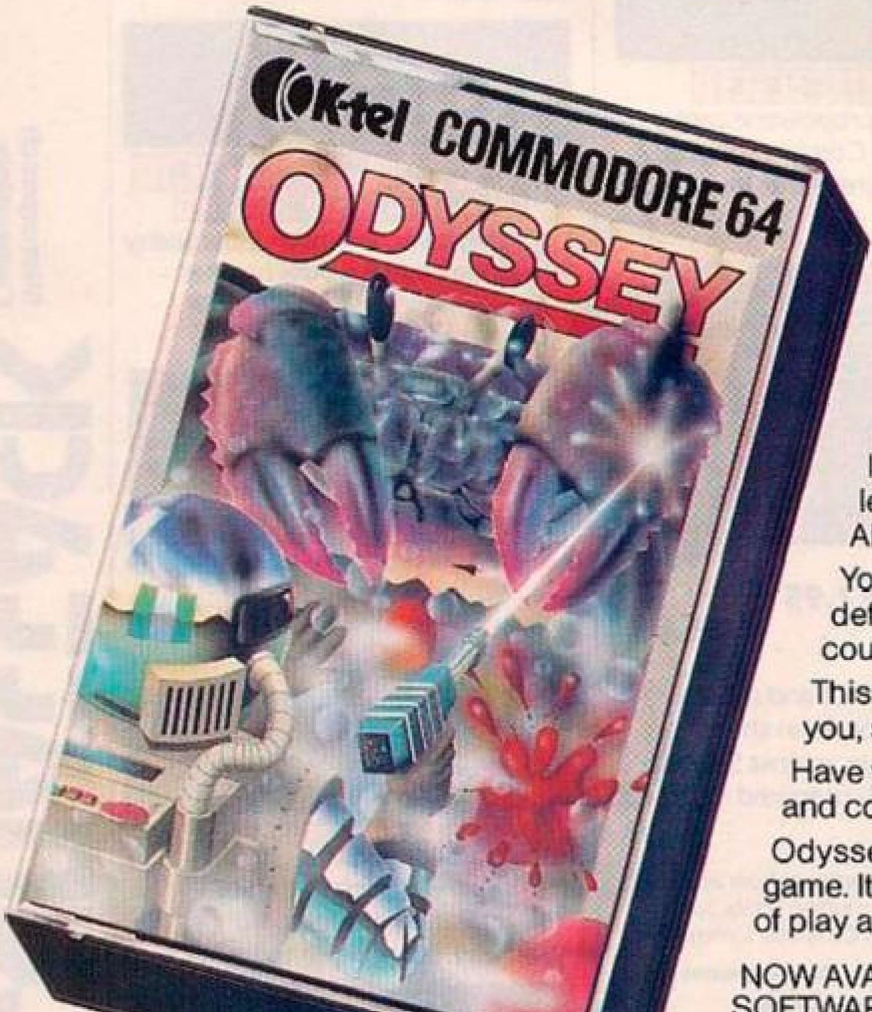
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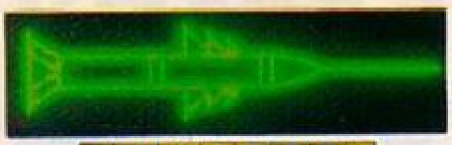


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In your Z5 Luna Hover Fighter you must penetrate the 3 successive Seiddab defensive zones and destroy their command base.

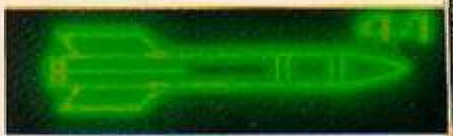
The state of your fighter and its armaments along with status reports of the Seiddab defences is given below.

Good luck! May the power be with you.



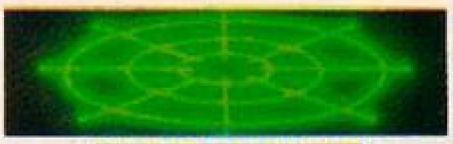
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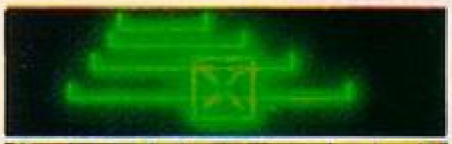
·MISSILES·

Long range weapon system. Radar homing duodec warhead. Armed and ready to fire.



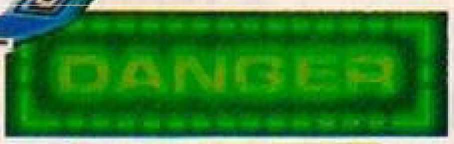
·RADAR·

Long range, over the horizon sensors. Tuned to the plasma output of Seiddab hover fighters.



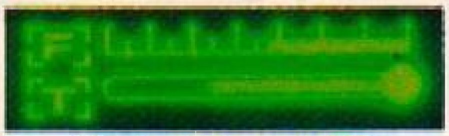
·NAVIGATION·

Locked on to the Seiddab command base. Head up path display.



·SHIELDS·

Di-lithium powered. Combat power level. Status all green.



·GAUGES·

Long range propeluene tanks. Status full. Combat shielded. Hull temperature status low.



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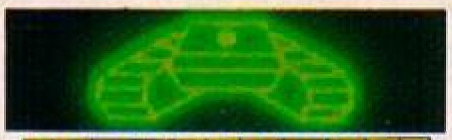
This is the latest and most difficult mission in the long running struggle against Seiddab aliens – are you prepared to accept this mission?

Available for 48K Spectrum from all leading software dealers including Boots, John Menzies, Spectrum Computer Centres, etc.

Available for other popular home micros soon.

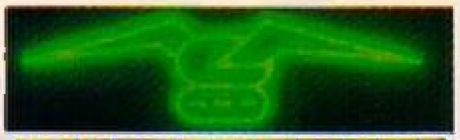
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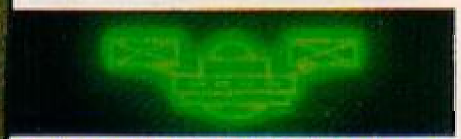
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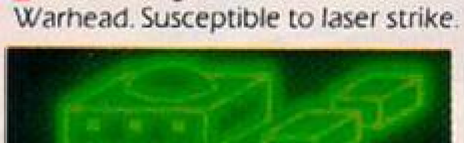
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Languages Included	Basic
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Keyboard Facilities	10 programmable keys
Character Set	256 in ROM
Method of Display	TV, RGB, Comp/Sync colour or monochrome monitor
Display Facilities	Full screen handling, 4 screen paged
Text	80 x 25 or 40 x 25
Graphics Resolution	320 x 200 or 640 x 200
Colours Available	16
Graphics Facilities	Scroll, reverse image
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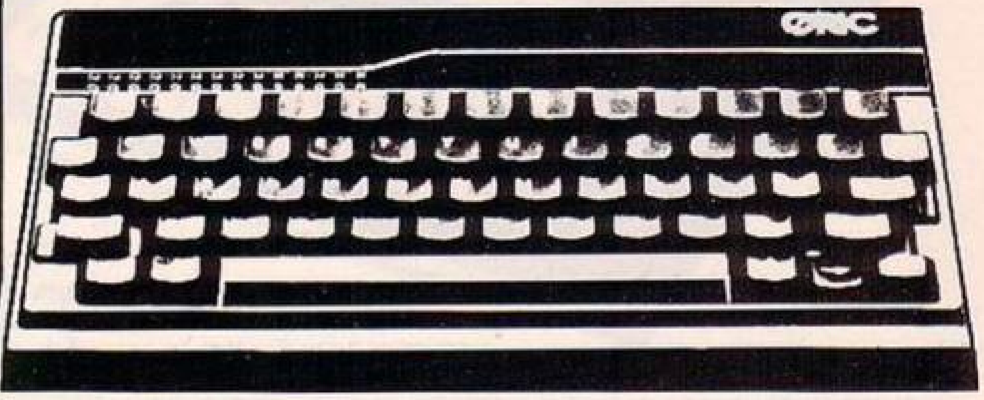
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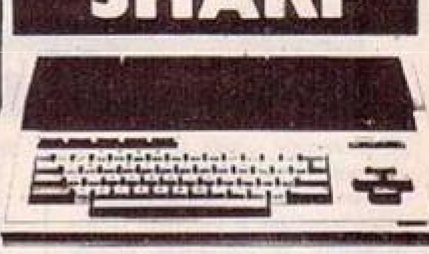


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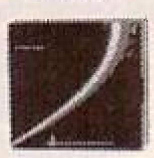
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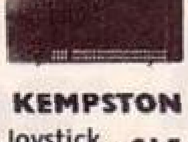
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```
2 REM *          BOMBER          *
3 REM *    By RICHARD TAYLOR     *
4 REM * © CRL September '83      *
5 REM ****************************
6 REM
10 RANDOMIZE 1000
20 RANDOMIZE USR 61030
30 RANDOMIZE : BORDER 6
40 OVER 0: INVERSE 0: FLASH 0
50 BRIGHT 0: INK 0: PAPER 7
60 CLS
70 GO SUB 9000
80 GO SUB 8000
90 LET Hi=0: LET z=1: LET Score=0
100 CLS : PRINT "  HI:";Hi;TAB 20;"SCORE:";Score
110 PLOT 0,163: DRAW 255,0
120 LET a=4000: REM LIMIT a
130 LET a=6000: REM INTERACT a
140 GO SUB 3000
150 LET x=0: LET y=50: REM MOVE Plane,x,y
160 LET x=255: LET a=30: REM MOVE Enemy,x,a
170 GO SUB 2000: GO TO 170
1000 LET a=0: LET b=176
1010 REM MOVE Plane,a,b\ENABLE Plane
1020 REM ALL Bomb\MOVE Bomb,a,b
1030 REM ENABLE Bomb
1040 REM MOVE Enemy,a,b\ENABLE Enemy
1050 CLS
1060 FOR a=0 TO 7
1070 PRINT PAPER a;: REM FILL
1080 BEEP .1,a*5: NEXT a
1090 PAUSE 25: FOR a=60 TO 0 STEP -1: BEEP .005,a: NEXT a
1100 FOR c=0 TO 1000 STEP 20
1110 LET a=10: LET b=3: LET d=50
1120 REM SOUND a,b,c,d
1130 NEXT c
1140 LET a$="SCORE:"+STR$ Score
1150 LET x=0: LET y=50: LET l=2: LET w=3
1160 REM TEMPS\LARGE
1170 IF Hi>Score THEN GO TO 1200
1180 LET Hi=Score: LET a$="A New HIGH SCORE"
1190 LET x=60: LET y=100: LET l=2: LET w=1: PRINT INK 1;: REM LARGE
1200 PRINT #0; FLASH 1;"          A New Level? [y/n]     "
1210 IF INKEY$<>"" THEN GO TO 1210
1220 IF INKEY$="n" OR INKEY$="N" THEN GO TO 1500
1230 IF INKEY$<>"y" AND INKEY$<>"Y" THEN GO TO 1220
1240 INPUT "New Level? ";Level
1250 IF Level<0 OR Level>3 OR Level<>INT Level THEN GO TO 1240
1260 GO TO 90
1500 INPUT INKEY$: PRINT #0; FLASH 1;"        Another Game? [y/n]    "
1510 IF INKEY$<>"" THEN GO TO 1510
1520 IF INKEY$="y" OR INKEY$="Y" THEN LET Score=0: LET z=1: GO TO 100
1530 IF INKEY$<>"n" AND INKEY$<>"N" THEN GO TO 1520
1540 LET a$="OK": LET w=16: LET l=22
1550 CLS
1560 LET x=0: LET y=0: REM TEMPS\LARGE
1570 LET a=21: LET b=31: REM GET x,y,a,b,a$
1580 FOR a=0 TO 21: LET b=a*.6875
1590 REM PUT a,b,a$
1600 PAUSE 5: NEXT a
1610 LET a=INT (RND*8): PAPER a: BORDER a: CLS : BEEP 1,-10
1620 GO TO 1610
2000 LET a$=INKEY$: IF a$="" THEN RETURN
2010 IF a$="6" THEN LET y=y+1+(Level<2): LET Score=Score-2
2020 IF a$="7" THEN LET y=y-1-(Level<2): LET Score=Score-10
2025 PRINT AT 0,26;Score;"  "
2030 IF y<20 THEN LET y=20
2032 IF y>160 THEN LET y=160
2035 REM MOVE Plane,COLUMN Plane,y
2040 IF a$<>"0" THEN RETURN
2050 REM USE Bomb,z
2060 LET z=z+1: IF z=4 THEN LET z=1
2070 REM LET a=LINE Plane\LET b=COLUMN Plane\LET c=LINE Bomb
2075 IF c<>176 THEN RETURN
2080 LET a=a+10: LET c=(INT ((c+4)/8))-32*(c>250): REM MOVE Bomb,b,a
2090 RETURN
3000 FOR a=2 TO 31: LET b=INT (RND*10)+1: IF RND>.8 THEN GO TO 3040
3010 LET d=INT (RND*5): FOR c=21 TO 21-b STEP -1
3020 PRINT AT c,a; INK d; BRIGHT RND;"■": BEEP .005,c+25: NEXT c
3030 PRINT AT c,a; INK d;"▲"
3040 NEXT a: RETURN
4000 REM LMTPARAM
4010 IF h$="plane" THEN GO TO 5000
4015 IF h$="enemy" THEN GO TO 4500
4020 LET o=176: REM LET p=CURRENT h$\USE h$,h\MOVE h$,COLUMN h$,o\ENABLE h$\USE h$,p
4030 CONTINUE
4500 REM LET o=LINE enemy
4510 LET o=o+11+INT (RND*6): IF o>=150 THEN LET o=150
4520 IF o<20 THEN LET o=20
4530 LET p=255: REM MOVE enemy,p,o\ENABLE enemy
4540 CONTINUE
5000 REM LET y=LINE Plane
5010 LET p=0: LET y=y+4: IF y>=138 THEN GO TO 5500
5020 REM MOVE Plane,p,y\ENABLE Plane
5030 LET Score=Score-1: PRINT AT 0,26;Score;"  "
5040 BEEP .005,60: CONTINUE
5500 LET a=176: LET b=0: REM MOVE Plane,b,a\ENABLE Plane
5510 REM MOVE Enemy,b,a\ENABLE Enemy
5520 REM ALL Bomb\MOVE Bomb,b,a\ENABLE Bomb
5530 POKE 23681,0: CLS
5540 LET a$="YOU HAVE LANDED"
5550 LET w=2: LET l=1: LET x=0: LET y=0
5560 PRINT INK 2;: REM LARGE
5570 LET Score=Score+200
5580 GO TO 1090
6000 REM INTPARAM
6010 IF h$="bomb" OR i$="bomb" THEN GO TO 7000
6020 IF h$="plane" OR i$="plane" THEN POKE 23681,0: GO TO 1000
6030 LET p=255: LET o=50: REM MOVE enemy,p,o\ENABLE enemy
6040 CONTINUE
7000 IF h$="enemy" OR i$="enemy" THEN GO TO 7500
7005 IF i$="bomb" THEN LET h=i
7010 LET o=176: REM LET p=CURRENT Bomb\USE Bomb,h\LET q=LINE Bomb\LET r=COLUMN Bomb\MOVE Bomb,COLUMN Bomb,o\ENABLE Bomb\USE Bomb,p
7020 LET q=INT (q/8): LET r=INT (r/8): IF r>31 THEN LET r=31
7025 IF q>21 THEN LET q=21
7030 LET p=q+INT (RND*5)+1: IF p>21 THEN LET p=21
7035 FOR o=q TO 10 STEP -1: PRINT AT o,r-1+(r=0);" ";AT o,r;" ";AT o,r+1-(r=31);" ": BEEP .01,o+30: NEXT o
7040 FOR o=q TO p: PRINT AT o,r-1+(r=0);" ";AT o,r;" ";AT o,r+1-(r=31);" ": BEEP .01,o+30: NEXT o
7070 LET Score=Score+8-(Level*2): PRINT AT 0,26;Score;"  "
7080 CONTINUE
7500 LET o=50: REM MOVE Enemy,COLUMN Enemy,o\ENABLE Enemy
7510 IF h$="bomb" THEN LET i=h
7520 REM LET p=CURRENT Bomb\USE Bomb,i\MOVE Bomb,COLUMN Bomb,o\ENABLE Bomb\USE Bomb,p
7530 CONTINUE
8000 LET a$="BOMBER": LET x=0
8010 LET y=0: LET l=2: LET w=5
8020 PRINT PAPER 5; BRIGHT 1;"
8030 REM LARGE
8040 PLOT 0,160: DRAW 255,0
8050 LET a$="   A Game using"
8060 LET x=0: LET y=25
8070 LET l=1: LET w=2
8080 REM TEMPS\LARGE
8090 PLOT 0,0: DRAW 255,0
8100 DRAW 0,175: DRAW -255,0
8110 DRAW 0,-175: LET l=3
8120 LET w=6: LET x=8
8130 LET y=35: LET a$="FIFTH"
8140 PRINT INK 2;: REM LARGE
8150 LET l=2: LET w=1
8160 LET x=55: LET y=65
8170 LET a$="By RICHARD TAYLOR"
8180 PRINT INK 1;: REM LARGE
8190 PRINT AT 12,5;"Key 6 to move down"
8200 PRINT AT 14,5;"Key 7 to move up"
8210 PRINT AT 16,5;"Key 0 to drop a bomb"
8220 PRINT AT 18,3;"  You must clear a path to";AT 19,3;"land on."
8230 LET a=3: REM OBJECT Bomb,a
8240 LET a=1: REM OBJECT Plane,a
8250 REM OBJECT Enemy,a
8260 REM PRINT Bomb,w
8270 REM PRINT Plane,w\PRINT Enemy,w
8280 LET a=1: LET d=2: LET b=3: LET c=6
8290 REM SPEED Bomb,b,c
8300 REM SPEED Plane,a,a
8310 REM SPEED Enemy,d,a
8320 PRINT INK 2;: REM COLOUR Bomb
8330 PRINT INK 1;: REM COLOUR Enemy
8340 LET a=7: REM VECTOR Bomb,a
8350 LET a=4: REM VECTOR Plane,a
8360 LET a=12: REM VECTOR Enemy,a
8370 FOR c=3 TO 13 STEP 10
8380 FOR a=0 TO 500 STEP 10
8390 LET b=5: LET d=80
8400 REM SOUND b,c,d,a
8410 NEXT a: NEXT c
8420 PAUSE 100
8430 BEEP .2,-12: BEEP .2,-10: BEEP .2,-8: BEEP .2,-12: BEEP .2,-12: BEEP .2,-10: BEEP .2,-8: BEEP .2,-7: BEEP .2,-5: BEEP .2,-5: BEEP .2,-8: BEEP .2,-7: BEEP .2,-5: BEEP .3,-5
8440 PAUSE 30
8450 FOR a=0 TO 7: PAPER a
8460 INK 9: PRINT PAPER a-1+8*(a=0); INK 8;: REM REPLACE
8470 LET b=40: LET c=5: LET d=0: LET e=90+a
8480 REM SOUND b,c,d,e
8490 NEXT a: PAPER 7: INK 0
8500 LET a$="    Press any key to continue   "
8510 PRINT #0;AT 1,0; BRIGHT 1;a$
8520 PAUSE 5: LET a$=a$(2 TO )+a$(1)
8530 IF INKEY$="" THEN GO TO 8510
8540 CLS
8550 PRINT AT 17,0; FLASH 1; BRIGHT 1;"SELECT LEVEL:"
8560 PRINT "0 - Easy"
8570 PRINT "1 - Medium"
8580 PRINT "2 - Hard"
8590 PRINT "3 - Very Hard"
8600 INPUT "Please Select:";Level
8610 IF Level<0 OR Level>3 OR Level<>INT Level THEN GO TO 8600
8615 REM ERASE Plane
8620 RETURN
9000 RESTORE
9010 FOR a=USR "a" TO USR "a"+47
9020 READ b: POKE a,b: NEXT a
9030 RETURN
9040 DATA 0,0,0,0,56,124,124,56
9050 DATA 255,153,153,255,255,153,153,255
9060 DATA 24,60,126,255,255,153,153,255
9070 DATA 0,152,145,159,223,153,153,255
9080 DATA 0,0,249,35,255,255,16,0
9090 DATA 0,0,159,196,255,255,4,0
9500 SAVE "Bomber" LINE 9990: SAVE "Data"CODE 61030,4339
9990 CLEAR 61029: LOAD ""CODE
9999 RUN
```

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CRL

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FRUSTRATED SINCLAIR OWNER

I was very interested to read in your magazine about the new Japanese MSX series of computers — it sounds as if they will provide just the type of machine I will need when I get rid of all my Sinclair bits and pieces and breathe a sigh of relief.

Don't misunderstand me — I am firmly committed to the idea of a strong, healthy British electronics industry, have a very high opinion of Sinclair achievements in breaking price barriers and bringing computers within the budget of ordinary mortals like myself, and would 'bend over backwards' to buy British, whenever I had the choice. I even have a perverse liking for Sinclair hardware when I am using it.



And there lies the nub of the problem — when I spend several hundred pounds on equipment I expect that it should be *available* to be used for a fair proportion of the time after I have paid for it. This of course entails prompt efficient servicing, reasonable periods of time between buying new accessories and having delivery and, when problems arise, as they invariably must, some form of explanation in the form of a card or phone call.

Alas my experience over the past few years has proved that this firm gets worse in its customer service, not better — I will not bore you with details as the catalogue is far too long, but try for an example a 12 month wait for a ZX-81 kit last year.

Now with the latest batch of problems my patience has finally given out. I cannot take any more from this infuriating company, and don't really see why I should any more.

Any offers for a 48K Spectrum — when I get it back, a Microdrive, Interface and tapes — when the outer Mongolian Post Office finally releases them, a ZX-81 with RAM pack, ZX printer, etc?

Anthony E Briggs, Buxton, Derbyshire.

TOOLKIT SAVE

My program published in the April edition of *Your Computer* contains an error which will stop the program working on the 16K Spectrum. The Toolkit program published on page 151 is listed correctly but the method of saving it on the 16K Spectrum is wrong. To save the program on the 16K Spectrum type:

```
SAVE "TOOLKIT":SAVE "BYTES"
CODE 31276,1330
```

You should also note that after using any of the routines the computer may give a Nonsense in Basic error. Ignore it as it is just one of the idiosyncrasies of the program.

Jason Charlesworth,
Kings Lynn,
Norfolk.

PROGAID AID

Mr Olivera's excellent program Progaid published in the March issue of *Your Computer* contains an error in the printed code which prevents the "UnRem" section from working. If the byte at address 16759, FF, which disassembles as RST 0038 is replaced with EB which disassembles as EX DE, HL the program will run correctly. The full line of code starting at address 16754 should read:

```
16754: AFED5228ECEBE523 = 1269
```

A faulty program already on tape can be corrected by loading it using the routine Fast, Rand USR 836, which will load and stop the program before it moves above RAMtop, entering Poke 16759, 235 and re-saving the program before testing.

M. Bernstein,
Derby.

TRUE TOP 20?

I read with some cynicism the letter from Nigel Sutton — April 1984 — concerning the compiling of a list of the top 20 games for a number of home micros.

The accuracy of this survey rests on the assumption that the many lists received will each be a representation of the personal choice of the sender. Towards the end of the letter however Mr Sutton suggests that a prize may be given to the person whose individual top 20 is most similar to that published.

How many people, I wonder, will treat this "survey" as a competition? It would not be difficult for a dedicated games player to construct the most probable top 20 games for his/her micro — easier than the pools I would imagine! Is this really a sound basis for a statistical survey? Could Mr Sutton be the herald of the Top of the Pops mentality of the computer world, and the dawning of a software underground? Roll on Micro-punk revolution!

Marcus Groan,
Bristol.

GOING KRAZY

Line number 10030 in my game Krazy Ape, seems to be confusing some readers. It should read:

```
10030 DATA #A2, #00, #BD, #C8,
#AF, #9D, #F0, #AF, #E8, #E0,
#F, #D0, #F5
```

Alternatively I am willing to supply the game on tape for £2 including post and packing. This should be sent to: Graham Bailey, 77 Gilbert Road, Frimley Park, Camberley, Surrey GU15 2RD.

QL OR NOT QL

Congratulations to Mr Sinclair for his new QL but, and here comes the problem, where does QL leave us Spectrum owners? I am one of those thousands who has been Sinclairised. I started with a ZX-80 which was a bargain at that time but soon afterwards, I had to purchase his ZX-81 which was a great improvement but, and it seems when you mention Sir Clive the buts keep popping up, the keyboard was a piece of dead flesh, and no HRG, and no colour and sound. But it seems it was worth it, at least the money not the wait, and at that time the ZX-81 was a revolution.

I used to imagine that Sir Clive would be a nice gentleman and give us some extras, changing the ZX-81 into a nice piece of hardware like the Spectrum. But instead he launched a new machine — the Spectrum. It had everything in it, colour, HRG, sound, better keyboard and a fantastic bargain price. So I said to myself I might as well purchase a Spectrum because I am sure that Sinclair will be drawing a full stop here, and will only be using his energy to expand our Spectrum into a dream machine.

But I, like thousands of others, am still waiting for a Sinclair typewriter quality keyboard and a sound chip which would give us sound, not a beep. At least he was kind enough to issue a Joystick Interface which arrived, as usual, late. I have around 30 programs, all commercial, bought at an average price of £5 each which makes them worth more than the Spectrum, but they are not compatible with Interface 2.

I would like to send only the one message to Mr Sinclair. I hope you do not expect me to purchase your QL so I could have a decent machine, unless you are kind enough to exchange my ZX-80, ZX-81 and Spectrum for your QL.

Joe Cilia,
Sliema,
Malta.

MEMOTECH MEMO

With reference to my article Memotech Memory — page 99, March issue — I would like to draw your attention to the following printing errors in the main program:

Lines 40 & 50 — CHAR$ should read as CHR$

Line 130 — the symbol is a > sign

I would also like to point out that the programs will also operate on a MTX-512 if all addresses marked #8000 (32768 dec.) are altered to #4000 (16384 dec.) to allow for the extra RAM in the 64K version.

David J. Miles,
Lowestoft,
Suffolk.

LANGUAGE SCOPE

I am writing in a very agitated state on the subject of Scope computer graphics language. The review in your April 1984 magazine which encompassed Scope was both unfair and misleading.

Scope is a language, not a "games designer" or a "compiler" and as such should not be likened to them. Scope has one very big advantage over the currently available compilers for the 48K Spectrum, speed! It does, in both its present and soon to be released improved states, run a good deal faster than currently available compilers, and the new Scope which is soon to be available has the added advantage of producing independently running programs, which means that Scope will not be required in RAM to run a program written using Scope.

RECONFIGURING YOUR VIC-20

On several occasions I have seen writers in your magazine suggest that it is possible to reconfigure a Vic-20 with 8K or more extra memory to 3K extra for the purpose of entering in machine code programs that would themselves run in an unexpanded machine. However as the 3K RAM area runs from 1024 to 4096 and 8K or more RAM runs from 8192 onwards this can not be done.

Reconfigurations of the type:

```
POKE641,0:POKE642,4:POKE643,0:POKE644,30:POKE648,30:
SYS64824
```

will result in only 3.5K of memory available although the computer will report 6.5K. The computer doesn't know that the memory chips aren't there but you can prove that this is false by trying the above reconfiguration, Poking some numbers into locations between 1024 and 4096 and then try to retrieve them.

However this difficulty is easily overcome by using the following reconfiguration:

```
POKE648,30:POKE642,32:POKE641,0:SYS64824
```

This puts the screen into the unexpanded position and Basic onto the other side of it, ie screen runs from 7680 to 8191 and Basic starts at 8192. This leaves the whole of the unexpanded memory area free and safe from Basic.

Some plus 3K games can be run this way but make sure to delete any reconfiguring pokes before running.

M.J. Curtis, Stalbridge, Dorset.

As a co-author of this new Scope, and being involved in programming with the old Scope, I feel very upset at the abuse which is being dealt to Scope by reviewers who have not used it, and are therefore not qualified to comment upon it!

By the way, please stop insulting Fifth as well which, though it is produced by a rival company, is again a very good utility which is being unfairly reviewed also.

Matthew Probert,
Haslemere,
Surrey.

• I am at a loss to understand why Mr Probert is so het up Anyone who turns to the article in question will see that I wrote quite favourably of Scope. I was indeed impressed with Scope's speed and said as much in the review. Far from likening it to a games designer I explicitly contrasted it with the games designers reviewed earlier in the piece.

As for Fifth I rated it very highly. In fact I suggested that it was just as effective as Scope but easier to use.

INPUT ITEM

According to your problem Input Items — February — Response Frame — I must give a little correction. It is quite simple to enter Input items at different screen locations. Just try the following example:

```
10 INPUT AT 22,0; AT1,10; "ENTER
A NUMBER";a
```

This will produce an Input item at the top of the screen.

Hubert Surrer,
Goethestr. 15,
Germany.

CORRECTIONS

There was an error in the text accompanying Mark Jones' Multi-Programming facility in the April issue. To change the program you are currently handling you should press Symbol Shift and Space and not Cap Shift as given.

The last line of the machine code dump in April's ZX-81 game, Laser Duel, should not be entered unless you have created a Rem statement larger than 1100 characters. When you have entered the line starting at address 17604 input the Stop statement to bring the loader program to a halt.

Anyone still having trouble with February's Interceptor game for the Dragon could try inserting the following line:

```
476 POKE&H6EC1,12:
    POKE&H6E2,12:
    POKE&H6EC3,12
```

This removes the code which speeds up the processor.

We have been asked by Mine of Information Ltd., to point out that they are the proprietors of the registered trademark "Othello" in respect of printed matter relating to computer programs.

EDITORIAL

ONCE YOU HAD FINISHED building your Scrumpi or Kim 1 back in the pioneering days of 1978, you could experience the joy of pounding machine code in through their full hexadecimal keypads. It was rather like buying a car in kit form, assembling it and then being expected to refine its fuel as well.

By last year we were a little luckier. Home computers were more or less complete. Of course a cassette player had to be snatched away from junior and the household television switched over from *Crossroads* to channel 36.

The motoring equivalent of this would be having to supply your own seats for the family's new limosine. Up and down the country three-piece suites would be dividing their time between living-rooms and garages.

1984 is the year of the system. In January we published the first review of the Coleco Adam. Its package of computer, printer, high-speed tape storage and built-in word processor goes some way towards the concept of a complete system that the public seems to want.

In that same month Sinclair revealed the QL. Again, although no printer, mass storage and bundled software are two of its main selling points.

Now Amstrad's CPC-464 has arrived with its monitor and built-in cassette player for £200. Even Commodore is building software into its new 264.

Each of these machines falls short of the ideal of total computing in one way or another. The Amstrad is supplied without software, the QL has no printer, the Adam no monitor, and so on. However, all these micros do underline the trend towards the complete home computer system.

Of course some of the latest arrivals on the home-computing scene seem to go against this tide. For example, whatever the merits of the £200 Electron's excellent BBC Basic, you would have to spend a good deal of money on Acorn's computer to bring it up to the Amstrad specification.

The results of our Design a Micro competition published in last month's edition showed that what many of you want is a system that can be set up and run immediately, that is packaged up with its main peripherals and which will not lead to family squabbles over the use of the television.

This wonder-machine would cost less than £500, and offer discs, printer, screen, Modem and software — word processor, a filing system and graphics package — as standard.

But this idea of a complete system is nothing new. It has always been the norm in the business market and has been tried before without success in home computing. Sharp's 1981 MZ-80K had a built-in screen and tape recorder but failed to make its mark because of a shortage of commercial software.

Manufacturers of business computers are going out of their way to make their machines more accessible to a wider audience with the use of touch screens, icons and mice. The move towards more complete systems may be home computing's equivalent of this but it is still overlooking the obvious. Very little has been done to make programming easier.

Resident program-writing programs could be the answer although they might not be in the manufacturers' best interests: people might spend more time writing their own games rather than buying them. But as things stand at the moment, you are still expected to be a fully-qualified mechanic as well as the driver.

How to write for *Your Computer*

We called this magazine *Your Computer* precisely because we welcome your views, tips and hints and even your criticism of machines and software in general. If you would like to see your name in print, whether on a Software File program or a full-blooded article, here is how to go about it. Ideally, all articles should be typed double-spaced on one side only of uniform sheets of paper. If listings can be dumped directly from a printer — you can always use a friend's or user group's — this minimises the risk of error. In a perfect world a cassette would accompany the article. That considerably speeds up the checking process. Not only do you get to air your own discoveries and opinions, but we will even pay you for the privilege. We pay £35 per published page — that's as it appears in the magazine and includes illustrations.

Why not give it a try? You have nothing to lose but your postage.

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YOUR COMPUTER TOP 20

Game	Machine	Company
Asteroids	ZX-81	Quicksilva
Atic Atac	Spectrum	Ultimate
Chequered Flag	Spectrum	Psion
Chuckie Egg	Dragon	A&F
Colony 7	Atari	System 3
Crazy Kong	Vic 20	Intercept-or Micro
Eight ball	Dragon	Microdeal
Flight 015	Vic 20	Ferranti/Davenport
Fortress	BBC	Pace
Hunchback	CBM 64	Ocean
Hunchback	Spectrum	Ocean
Jet Set Willy	Spectrum	Software Projects
Lunar Rover Patrol	Dragon	Dragon
Manic Miner	CBM 64	Software Projects
Revenge of the Mutant Camels	CBM 64	Software Projects
Scramble	ZX81	Quicksilva
Scubal Dive	Oric	Purnell
3D Ant Attack	Spectrum	Quicksilva
Twin Kingdom Valley	BBC	Bugbyte
Zaxxon	Atari	Centresoft

Video nasties Bill includes computer games for first time

1.—(1) The provisions of this section shall have effect for the interpretation of terms used in this Act. **Interpretation of terms**

(2) " Video work " means any series of visual images (with or without sound)—

(*a*) produced electronically by the use of information contained on any disc or magnetic tape, and

(*b*) shown as a moving picture.

(3) " Video recording " means any disc or magnetic tape containing information by the use of which the whole or a part of a video work may be produced.

(4) " Supply " means supply in any manner, whether or not for reward, and, therefore, includes supply by way of sale, letting on hire, exchange or loan ; and references to a supply are to be interpreted accordingly.

PRESSURE GROUPS are keeping a close watch on computer games in case they become the next video nasties. Already Mary Whitehouse's National Viewers and listeners Association has had complaints. NVLA spokesman John Beyer says "we are getting letters from anxious parents". A Buckingham vicar is circulating warnings to schools about the damage violent computer games might do. Yet M.P. John Bright's video nasty Bill currently going through Parliament specifically mentions video games.

Software houses have reacted in different ways to the pressure. Artic, whose Ship of Doom has been attacked as a computer nasty denies the charge. Artic says the program is "neither obscene, nasty, grisly, sick or corrupting" although admitting that certain bits of the text "could give rise to offence."

Brian Bandey of Allrian which has sold thousands of Strip Poker games on disc for the Artic says "its such a difficult question when you think about morality and computer games." Now Allrian is producing Commodore 64 Strip Poker which allows you to "experience the heady delights of Suzi or Mellisa in a game of thrills, skills and excitement." Brian Bandey describes it as an "adult" game but admits "there is no way you can say to dealers you must not sell it to people under 18."

Austin Rover Montego talks even more than a Maestro

ONE YEAR ON from the launch of the Maestro, Britain's first talking car, Austin Rover releases the Montego at the end of April. The Montego is a Maestro with a boot and a bigger vocabulary. Rather than just warning of low oil pressure, like the Maestro, the Montego tells you to pull into the side of the road and have the oil checked. The Motorola 6805-based system built into the dashboard (also has a liquid Crystal Display to spellout simple warning messages in case you are wearing a Walkman.

Take your privacy case to the House of Lords — Cliff will pay

CLIFF STURT is not selling licences to kill pirates — yet — but he is offering to pay 95 per cent of your costs if you want to drag them through every court in the land.

As always, there are a few catches. First you need to find £75.75 to register your program with newly formed Software Registry. Along with the crispy fivers you must produce a program listing on paper and sign a guarantee that it is your own copyright and not pirated from elsewhere.

This will be held for five years at a secure location not far from the law courts in London. Now you can approach a software house offering that program which you are sure is going to make your fortune, safe in the knowledge that you have independent evidence of when you wrote the program — so they can't turn round and say it was there all along.

For the first year the Software Registry will pay most of your costs if you decide to take someone to court for stealing your program — even if it goes all the way to the House of Lords with doddery old men in wigs trying to work out what Henry VIII's lawyers would have though about Space Invaders.

Cliff would have preferred the government to register all programs rather like the American system "but in the absence of the Government doing it we're going to do it instead".

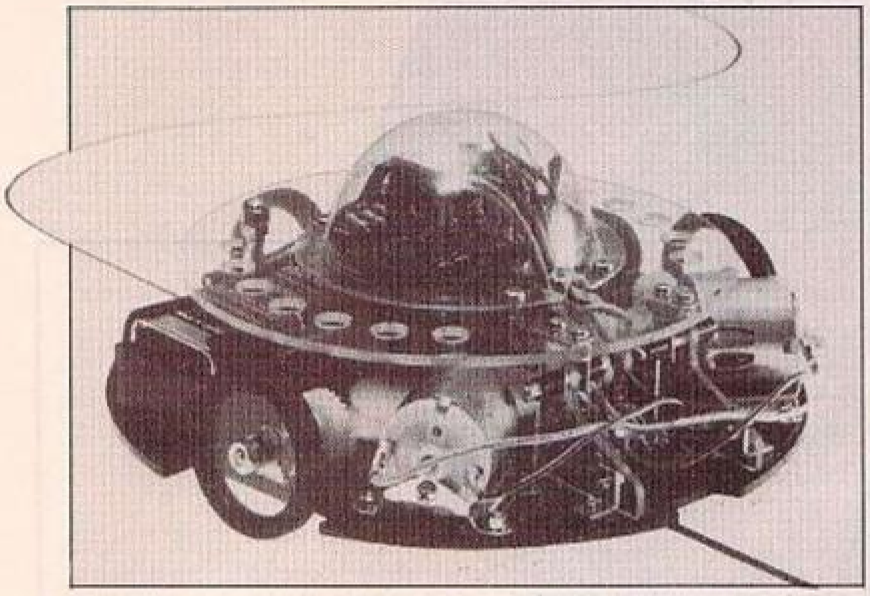
RD Laboratories Tracer for the Spectrum has already sold by the thousand. Now the Tracer, which allows you to trace out shapes or maps from a piece of paper straight onto screen is available for the BBC micro for £70 including software. RD Labs is on (0633) 74333.



At £17 for a pair these Strike Control joysticks for the Dragon and BBC are some of the cheapest around. Contact Consumer Electronics on 061-682 2339 for more information.



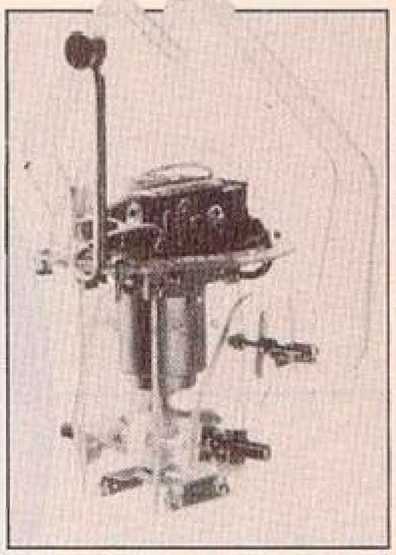
Prism's robot monkey business will make for cheaper turtles



CLAP YOUR HANDS and the Movit Monkey will scamper along the line it hangs from. Whistle, and the Movit Piper Mouse will whizz across the floor.

Movits are simple, cheap do-it-yourself robots from Prism which range form the £10 Monkey which only accepts two commands — Go and Stop — to the radio-controlled Circular and the programmable Memoconn Crawler which will execute a series of 250 steps — left, right and forward — while flashing its light and beeping to itself.

Prism is working on an interface so that the £35 Crawler which at present is controlled by a hand-held keypad can be operated from a micro, rather like a BBC Buggy or a turtle. Spectrum, Commodore and BBC versions are planned.



So far Stuart Barnard, Prism's robotics chief has found that adults find it difficult to put the Movit construction kits — which require no soldering — together. But the teenagers and children who the products are aimed at have had no problems.

Mid-range Rabbit and Tatung top end micro from East

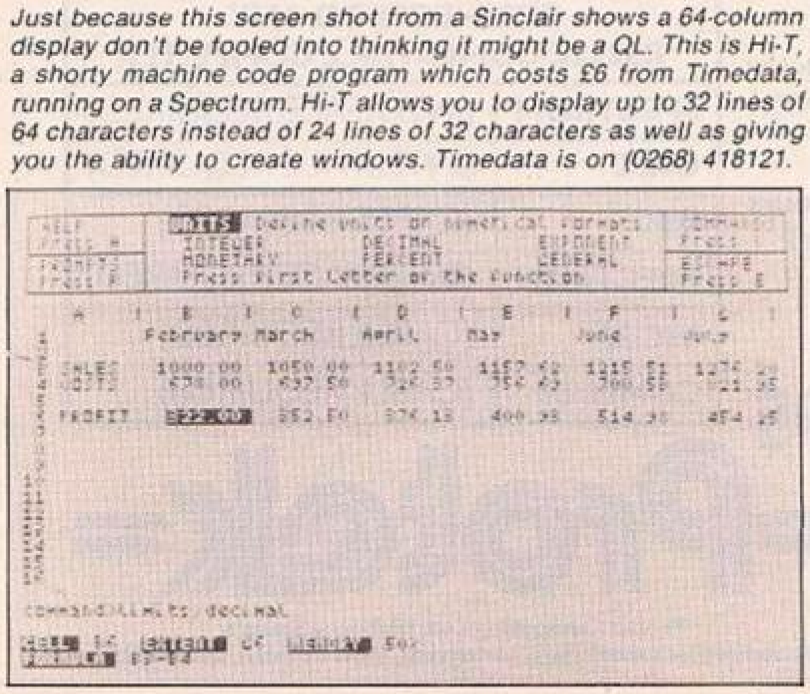
TWO NEW home micros from the Far East hit Britain this month. One is the £500 Tatung home computer and the other is the £250 Rabbit from Hong Kong. The Rabbit is an 80K Z-80 based micro. It uses the standard Texas graphics chip to give 16 colours, 256 by 192 resolution and 32 sprites. With an adaptor it will take Coleco vision games cartridges.

Single disc home office on BBC Micro



FILM-MAKER Peter Armstrong wanted a word processor, address data base and spreadsheet all on one disc for his BBC micro. In the end he decided to write his own which has now been released under the name One Disc Home Office who are on (0903) 206076 by Doctor Soft. The company does not pretend that the software is as powerful as individual word processors and spreadsheets on disc but the whole package costs £20.

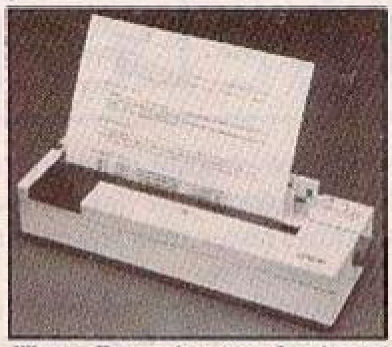
Just because this screen shot from a Sinclair shows a 64-column display don't be fooled into thinking it might be a QL. This is Hi-T, a shorty machine code program which costs £6 from Timedata, running on a Spectrum. Hi-T allows you to display up to 32 lines of 64 characters instead of 24 lines of 32 characters as well as giving you the ability to create windows. Timedata is on (0268) 418121.



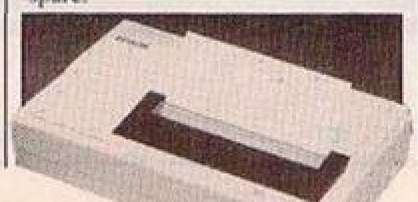
Mastertronic games: price war returns

AT LAST the price war seems to be bringing down software prices. Mastertronic, on 01-486 3478, is charging £2 a time for its games cassettes which will be available from computer games stores initially. The programs — which are mainly variants of the old favourites Pac-Man, Duckshoot and so on are being described as the equivalent of Music for Pleasure albums. But Imagine which tried to bring its prices down to £4 last month has had to put them back up to £6 after dealers complained about low margins. Can Mastertronic succeed where Imagine has failed?

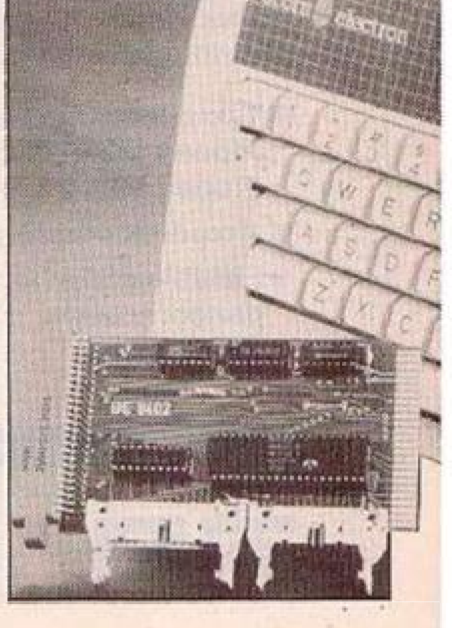
Epson prints portable

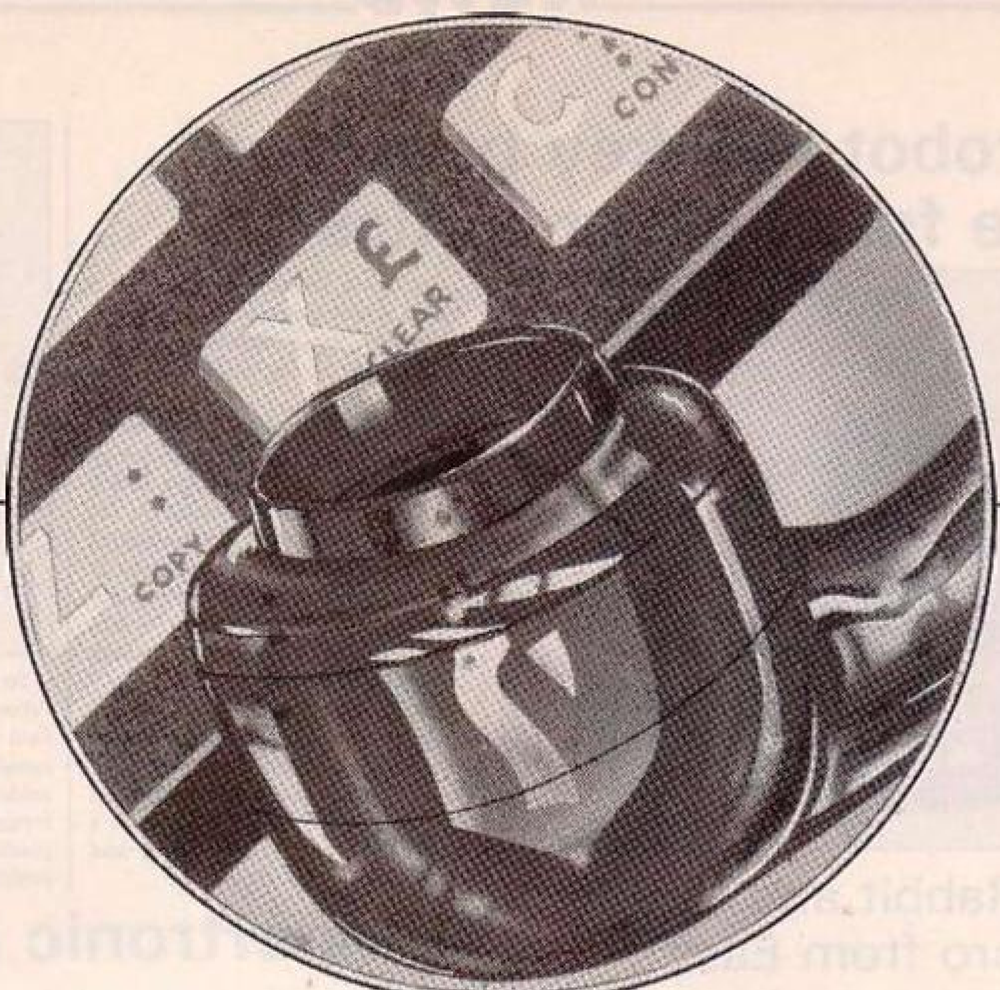


WHILE EPSON prepares for the top secret launch of its new portable computer the company has shown three new printers, including the P-40 portable 40-column thermal printer which can print condensed 80-column for around £100 and a portable 80-column, the £180 P-80 which uses thermal transfer cassettes like the Brother does to print on plain A-4 paper. Third in the list is the JX-80 colour dot matrix which converts to monochrome at the touch of a button — if you have £600 to spare.



Peripheral makers like Broadway Electronics are setting up a whole industry based on the inadequacies of the Electron's interfacing capabilities. This £40 printer and user port from Broadway comes complete with drive software and screen dump routine. Joystick, cartridge and disc drive interfaces are under development. Broadway is on (0234) 58303.





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ADVENTURE REVIEWS

"Adventures which have a fast response time, are spectacular in the amount of detail and number of locations, and are available to cassette owners .. Simply smashing!"
– Soft, Sept 83

"**Colossal Adventure** is included in Practical Computing's top ten games choice for 1983: "Poetic, moving and tough as hell.""
– PC, Dec 83

"**Colossal Adventure** .. For once here's a program that lives up to its name .. a masterful feat. Thoroughly recommended"
– Computer Choice, Dec 83

"**Colossal Adventure** is one of the best in its class. I would recommend it to any adventurer."
– Acorn User, Feb 84

"**Adventure Quest** .. This has always been one of the best adventures for me as it seems to contain the lot. In all it took me about eight months to solve."
– PCW, 18th Jan 84

"To sum up, **Adventure Quest** is a wonderful program, fast, exciting and challenging. If you like adventures then this one is for you"
– NILUG issue 1.3

"Colossal Adventure is simply superb .. For those who want to move onto another adventure of similar high quality, **Dungeon Adventure** is recommended. With more than 200 locations, 700 messages and 100 objects it will tease and delight!"
– Educational Computing, Nov 83

ADVENTURE REVIEWS

"Colossal Adventure .. undoubtedly the best Adventure game around. Level 9 Computing have worked wonders to cram all this into 32K .. Finally **Dungeon Adventure**, last but by no means least. This is the best of the lot – a truly massive adventure – you'll have to play it yourselves to belive it."
– CBM 64 Users Club Newsletter

"The puzzles are logical and the program is enthralling. **Snowball** is well worth the money which, for a computer program, is a high recommendation."
– Micro Adventurer, Dec 83

"**Snowball** .. As in all Level 9's adventures, the real pleasure comes not from scoring points but in exploring the world in which the game is set and learning about its denziens .. this program goes to prove that the mental pictures conjured up by a good textual adventure can be far more vivid than the graphics available on home computers."
– Which Micro?, Feb 84

"**Lords of Time.** This program, writen by newcomer Sue Gazzard, joins my favourite series and is an extremely good addition tó Level 9's consistently good catalogue .. As we have come to expect from Level 9, the program is executed with wonderful style – none of those boring "You can't do that" messages! Highly recommended."
– PCW, 1st Feb 84

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THE LORDS OF TIME SAGA

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Our congratulations to Sue Gazzard for her super design for this new time travel adventure through the ages of world history. Chill to the Ice-age, go romin' with Caesar's legions, shed light on the Dark Ages. etc.

Price: £9.90 each (inclusive)

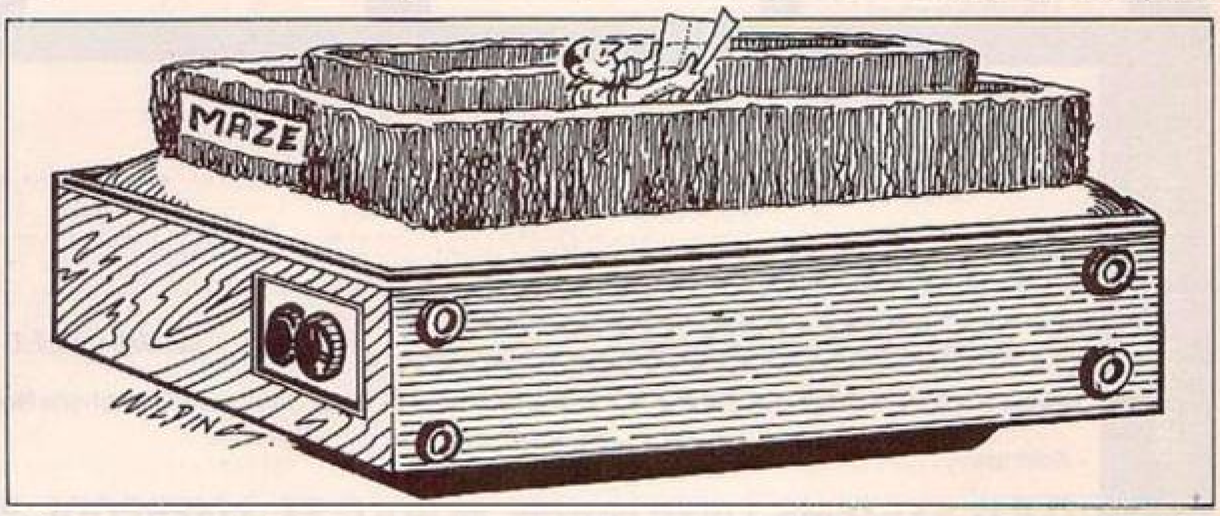
Level 9 adventures are available from good computer shops, or mail-order from us at no extra charge. Please send order, or SAE for catalogue, to:

LEVEL 9 COMPUTING

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Please describe your computer

BEGINNERS first bytes

Starting out in home computing? First Bytes is for you. Just write to *Your Computer* with any hardware or software problems, no matter how small or simple.



I could do that...

Seen any interesting bugs lately? If so we would like you to send them in. This month's competition offers £15 to the program with the most subtle and hard to spot bugs. Nothing too obvious please. We are looking for quality not quantity.

The program should be no more than 15 lines long with no multi-statement lines. It should have a single clearly defined task which we would like you to explain in your accompanying letter. To make the job of our competition judge easier you will also need to indicate why the program does not work.

J. Burgess, Greenslates, Bexton Lane, Knutsford, Cheshire, is the winner of March's competition. His program runs on a Spectrum and prints a message around the circumference.

```
10 INPUT M$
15 LET R=10
20 FOR V=1 TO 8
30 FOR I=0 TO 2 STEP 2.1/R
40 FOR N=1 TO LEN M$
50 LET A=(I+N/20)*PI
60 LET X=16+R*SIN A
70 LET Y=11-R*COS A
80 PRINT AT Y,X;M$(N)
85 NEXT N: CLS : NEXT I
90 LET R=R-SGN SIN (V*0.7)
100 NEXT V: GO TO 15
```

Screen memory?

"What does the term 'screen memory' mean?"

THE SCREEN memory is sometimes called the video RAM or the screen map. As the word map suggests it contains a copy of the information on screen. The computer allocates a region of RAM specifically for this purpose and since it is in RAM it is accessible to the user.

By dealing directly with the screen memory — Peeking and Poking to it — you can manipulate graphics and text on screen. This is often quicker than using Print or Plot commands from Basic. And if you wish to write a game in machine code it is generally the only way of handling graphics.

There are various ways of representing the information on screen in memory. This month we will concentrate on the simplest method, the character mapped screen. Each character on screen is represented in the screen map by its ASCII code. Each takes up one byte so a 40 by 25 screen needs 1000 bytes for its memory map.

When the computer prints to the screen it first note the code stored in RAM and then consults the character generator in ROM. The character generator — also known as the character font — holds the pattern of dots which make up the characters.

This process takes place many times a second: the hardware repeatedly scans the RAM, consults

(continued on page 51)



Computer add-ons

ONCE YOU HAVE BEEN using computers for a while you start to look round at the bits of hardware that you can use with your machine — i.e. what add-ons are available. Once you have exhausted the list of normal things — disc drives, cassette units, printers, monitors and the like — you notice a whole group of unclassifiables — the more unusual things that can be plugged in to your micro.

Since most micros are used as games machines the most obvious contenders for the unlikely add-on award are unusual games controllers. At the simple end of the scale there are bizzare joysticks. Notable among these is Le Schtick, which has what looks like a normal handle, but has no base against which to move it — i.e. a free handle with a lead coming out of the bottom.

Another odd games controller is the Trickstick for the Spectrum from East London Robotics. This senses the blood running through your hand, and has six buttons to control the game . . . rumour has that you either love it or hate it.

Getting more popular by the minute, and more so since the release of the new Atari model, are ball controllers. These are meant to mimic the movement of the hand, and with the right software can be devices that measure both speed and acceleration — depending on how fast the ball is spun. At the moment the quality of these depends a lot on how much you pay. In the future these ball controllers may well be used in keyboards as replacements for the cursor keys, since they enable you to control position simply, quickly and accurately.

This brings us on to mice. A mouse is any device that uses the concept of running along something to indicate movement to a computer. In practical terms it means a ball

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BEGINNERS first bytes

Screen memory?

(continued from page 49)
the character font and refreshes the screen.

In addition to the code for each character the computer also needs to store information about its colour. On the Vic-20 and CBM-64 colour codes are stored in a separate colour memory which mirrors the screen memory, matching up colour codes with character codes byte for byte. In Teletext mode on the BBC colour codes are stored in the screen memory in front of the characters whose colour they determine.

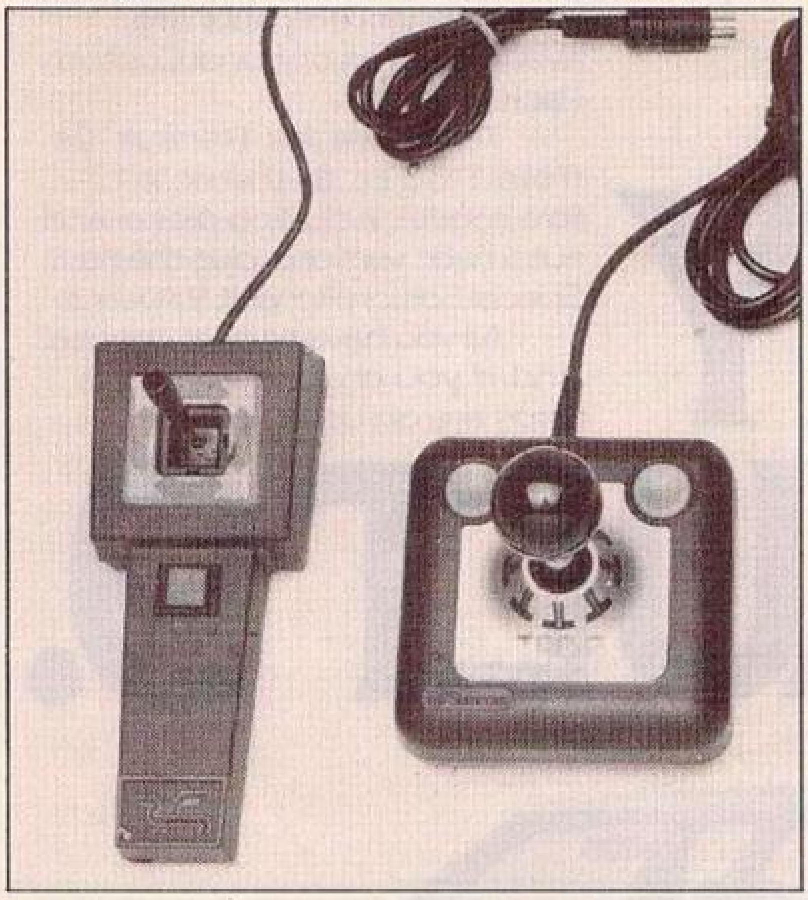
The advantage of having a character mapped screen is that it is economical on memory. The drawback is that by confining you to a predefined character set it usually rules out what is generally understood by computer graphics — individual pixel plotting.

Some computers, however, allow you to define your own characters. In effect they enable you to redirect the hardware to a new character font in RAM.

By exploiting this facility you can give a micro with a character mapped screen a limited degree of high-res graphics. The method involves dealing directly with the new character font rather than the screen memory. Each character definition takes up eight bytes to describe the character on an eight by eight grid; by altering these bytes you are effectively plotting or unplotting the pixels within a character space. Your character mapped screen has now become a bit maped screen in which each pixel is represented by a bit in RAM.

Bit mapped screens will be discussed in next month's First Bytes. If you want to investigate your character mapped screen you must first find out what part of memory it occupies. Look up the screen memory's start address in the manual and Poke 65 to it.

You should see the letter A in the top left-hand corner. Poking consecutve locations will place letters along the first row. Commodore owners should remember also to Poke colour codes to the corresponding locations in the colour memory map.



Computer add-ons

(continued from page 49)
controller used upside down. Mice are used to indicate position for the main part, but are also used for tracing — maps, diagrams etc. — and as educational aids. Mice are popular with businessmen because they are easy to use.

Mice are much the same as simple robots. The main difference is that robots are usually controlled by the computer, rather than the robot giving the computer information. Robots are currently one of the most expensive add-ons it is possible to buy for your micro, but watch out for them as they will be widely used in the future.

Another odd add-on that is finding its way into more and more micros is speech. For the time being this is mostly reserved to having your computer talk to you, but in the future it seems likely that you will be able to talk to it. At the moment speech recognition systems are incredibly expensive, but the price is falling fast. Speech synthesisers — the ones that talk to you — are either made to work by having a set of words it knows, or having a set of sounds that can be built up into words. At the moment both types sound more or less like computers in films — with the notable exception of 2,001's HAL, of course — or robots.

Light pens and graphics pads are two more areas where technology has yet to catch up with the potential demand. Both are applications that can be used for fun or for serious artistic work. As the resolution of screens increases there will be more and more graphic art type add-ons on the market. It is much more entertaining to be able to draw on the screen, rather than having to design and plot pictures pixel by pixel.

Animation techniques

"I am writing an arcade-style game in Basic. Can you tell me the best way to animate characters on screen?'

THE PRINCIPLE behind moving objects around the screen is straightforward enough: it is simply a matter of printing a character and then deleting it. But the time taken to do this, in Basic, can be excessive, especially if you want to move more than one character at a time. If your program has other tasks to attend to between printing you run the risk of ending up with a rather sluggish game. So it is important to find the fastest way of animating your characters.

Perhaps the simplest technique is to print a character and then delete it at the same position. Try this one line program, substituting an equivalent function if your version of Basic lacks TAB:

```
10 FOR X=1 TO 20:PRINT
   TAB(X,10);"A":PRINT
   TAB(X,10);" ":NEXT
```

The trouble with this method is that it gives a rather unsatisfactory flickering effect. We can improve on this by printing a character and then deleting it at the previous position. If you substitute X−1 for X in the second Print statement you will notice that the image is steadier.

As it stands this is certainly fast enough and you may want to slow it down by inserting an empty For Next loop after the first statement. But remember that your program will only return to the print routine when it has dealt with its other chores — performing calculations, reading the keyboard, checking for collisions, and so on. The more speed we can find the better.

Clearly one Print statement is faster than two, so a further improvement would be to incorporate the letter A and the delete character — in this case a space — in one string. To do this remove the second Print statement and insert a space before the letter A in the first statement.

What if we now want to move a character up and down or right to left? The problem here is that computers print from left to right but the character to be deleted is no longer immediately behind. One solution would be to reintroduce a second Print statement. A better method, however, is to incorporate cursor control characters in the string to be printed.

If you look at your computer's character codes you should find four cursor control characters. These have the effect of moving the print position one space in each direction. For example, if 8 and 1 are the codes for the cursor up and cursor left characters then PRINT "A" + CHR$(11) + CHR$(8) + "B" will print the letter B above A.

It is easier to assign these characters to a string variable first. This is illustrated in the following program which moves a character from top to bottom:

```
10 DOWN$="A"+CHR$(8)+
   CHR$(11)+" "
20 FOR Y=1 TO 20
30 PRINT TAB(20,Y);DOWN$
40 NEXT
```

If you adopt this technique you will need to set up four variables, one for each direction. It is also sometimes a good idea to write four seperate subroutines to handle movement. As well as printing the requisite variables these can cope with updating the direction coordinates.

Thus every time your program enters the Down subroutine the Y variable will be increased by one. Once again speed is at a premium here and you may find that executing Gosub commands imposes a heavy time penalty in your version of Basic.

There are, of course, several other animation techniques. If your micro has a character mapped screen it may be faster to Poke character codes directly into the screen memory. Either way you have to be content with moving objects a character space at a time. For the smoothest animation you need to move characters a pixel at a time. But to do this you will have to master machine code.

If you have anything of interest to tell us about your computer club why not contact us on 01-661 3144.

Local news

Gloucester

A congenial evening at 8 Linnet Close, Gloucester. This is the promise of the Midweekly Spectrum User Group, Gloucester. The group has its own cassette magazine and is dedicated to the mutually rewarding exchange of ideas. Telephone Barry Ledbury on 0452-23816.

North Staffordshire

Amateur Computer Club of North Staffordshire has now moved to the Frank Jordan Centre, Stone. This informal group of 10-20 persons meets on the first Tuesday of each month. Computers include Nascoms, Video Genies and the more common varieties. Contact Ken Cope on Ash Bank 5244.

Bristol

Format 40/80 BBC Disc User Group offers goodies like a four-disc pack for £5.50. Tapes are out says club organiser Peter Hughes.

For further information about the group, write to 5 Marsh Street, Bristol BS1 4AA.

Stratford

If Shakespeare had been into microcomputer hardware, would he have been a printed circuit bard? However this may be, the Stratford Computer Club meets once monthly at the Wesley Hall from 7 to 9pm. Contact Chris Parry, 16 Sackville Close, Stratford-upon-Avon, Warwickshire. Telephone 0789-68080.

COMPUTER club

Paul Bond goes back to school to learn about micros in Northamptonshire and meets Doris and Oscar the paranoid computers.



THE SOMBRE OSTINATO of Black Sabbath's "Paranoid" pulsed from the recreation area of Raunds Manor School as I arrived on a chill Northamptonshire evening to visit the local computer club. The school is very aware of its importance as a community asset — clustered under the huddled evening roofs of this expansive educational establishment you will find people from all walks of life: housewives studying needlework; insurance men dabbling in water-colours; mods, motor-cyclists and, needless to say, computer buffs.

While local predilection for heavy metal might lead one to think that little had changed in the last decade of school life, nevertheless the microprocessor has pulled Raunds Manor School out of the Stone Age.

Bryan Reed — an ex-Plessey man — is Head of Computing at this go-ahead grove of Academe. "We used to be connected to an ICL 2903 mainframe in Northampton," he explained, "but the phone bills proved too expensive."

Careful management of funds seems to have proved beneficial — an upstairs room is cram-full of well over a dozen research machines. The evening sessions, held every Tuesday from 5.30 to 9.30, are split into serious and games sections. Outsiders of all ages and sexes are welcome — you don't have to be a pupil.

The atmosphere upstairs is reminiscent of a starship coming down the curve, gathering momentum for its hyperspace jump, as young members sit purposefully moving their hands across keyboards. Elements of Hitch-hiker's Guide to the Galaxy also creep in as Lee Varga, acting treasurer, prods one of the RMLs into announcing in a Marvinesque voice: "I am a computer." Whether or not it wants to grow up to be a paranoid android, or to have a brain the size of a planet, you could speculate that its musical taste would be well in line with that of the Black Sabbath fans. The program itself was written by Gary Felse, a pupil; the synthesiser hardware and megaphone amplifier are the handiwork of Mr Reed and a colleague.

All the computers and monitors in the "quiet room" rejoice in personal names, lovingly Dymoed on by the Head of Computing one afternoon "as a form of light relief". Henry, Myrtle, Cedric and Henrietta — to name but a few — are easier to relate to than a batch of serial numbers. "It makes it less had for the kids to get involved with the machines" explained Mr Reed. But watch out for Doris and Oscar. These two have got some problems.

All the computers are hooked up to a 20 megabyte hard disc system and a Chain network server. As local area networks go it's small — just one room — but plans are afoot to spread this particular LAN all around the school.

Clive Packer, the acting secretary — both secretary and treasurer are pupils — pointed out that since, the installation of the LAN, pupils at the school have involvement in computing right from the word go. Formerly it was very much the province of those studying O-level computer science.

"A lot of people are anti-Basic," said Mr Reed, "but I feelt it's not fair to anybody if they don't learn some Basic. Some achieve things using one language that they couldn't achieve using another."

Asked about the merits of research machines, Clive Packer opined that in some respects they were not as fast as the BBC Micro which, like the Spectrum and the RML, is recognised by the UK government as a machine which educational establishments can get grants for installing. Under TVEI, the Technical Vocational Educational Initiative, Manor School's Technology Department will be receiving five BBC Micros.

An interesting project was on display downstairs in the not-so-quiet room, where games are the order of the evening. Well, almost on display. The computer-controlled railway layout had proved very popular since Christmas and was also used by a pupil working on an O-level project. Letting the train take the strain had, however, proved fatal to the little green locomotive, which lay smoking beside the N-gauge track.

When services are running normally, Darlington transistors function as light sensors in the track, just in front of the points. They switch the points just before the train arrives at them. They can be controlled either automatically, by computer program, or manually by using the function keys.

It's not all research machines at Raunds. Grouped under a poster proclaiming. "It takes a computer to REALLY foul things up" are three Acorn Atoms, cannibalised, it transpires, from five dud ones sent back to Acorn in those heady pioneer days of home computing. Somebody's dad works for Acorn, so these relics from a bygone era were rescued from the scrap-heap to fight off a few more waves of Space Invaders. Contemporaries of the Atom in the shape of rugged Sharp MZ-80As were to be seen glowing greenly in the half-light.

All this will soon change: the area is designated to become a "clean room" for the Technology Department's control projects. You too can wear a white coat, at least if you're a pupil. For more details of the club, which has around 50 members and costs £1.50 per year plus 10p an evening to join, telephone Bryan Reed at Raunds Manor School, on 0933-623921.

Star chart

City Attak

Commodore CBM-64:
Shoot-'em-up:
£6.95
K-Tel:

★ ★

The invaders are coming. They give no quarter. You fight a lost battle. Do not weaken. This is a combination of Space Invaders with elements of Defender. You fly through the city until you find a forward advancing horde. Down below, urban commandos advance on mission control. Periodically a big ball of neutrons rolls you flat. Every so often your flying saucer bursts into flames. A good idea but rather sloppily implemented.

Fire Ant

Commodore CBM-64:
Maze game:
£7.95
Phoenix:

★ ★

Tedious maze game. You are the lone ant battling against an overwhelming tide of scorpions who lay eggs all over the shop. You eat the eggs and are rendered strong enough to lift the key to get away from the porous arachnids. Eight screenfuls of this and you see the queen ant.

North Sea Oil

Dragon 32
Strategy
£5.75
Shards Software

★ ★

A simple text and graphics game of the finance-your-operation variety. As an oil installation manager you allocate resources then navigate the supply vessel to the rig.

You then pick a place or two to drill and operate the platform until you have collected 100m dollars. Explanations of hitches and hold-ups in drilling are realistic, making up for in educational terms what the game lacks in graphic excitement.

Teachers who want their kids to do projects on the North Sea might do well to have a look at this.

SOFTWARE Shortlist

Chinese Juggler

- *Commodore CBM-64*
- *£6.90*
- *Ocean Software*

★ ★ ★

THERE ARE FLYING saucers and flying saucers — the objective in this game is not so much to keep 'em flying as to keep them spinning. You know the kind of thing you see on TV when the Paul Daniels show reaches a low ebb and they bring on this guy who rushes around trying to keep spinning plates balanced on the tops of poles? Well, now you can switch off, plug in your 64 and have a go at it yourself without decimating your parents' priceless collection of Dresden china.

The curtain literally goes up on one of the great mysteries of the east — why do people balance plates on poles? Perhaps it is to keep them away from insects. You move a little Chinese man about the stage, taking saucers from their elaborate oriental rests at the front and balancing them on top of a veritable avenue of poles stretching into the backcloth. This is all done by judicious use of the joystick and fire-button. You can even perform trick-shots like chucking the saucer over the juggler's head and catching it by spinning around. This also changes the plate colour.

Like many a good CBM-64 program, this one is really made by the music. The non-stop carnival backing has a manic appeal. The way that the plates spin on top of the poles is very convincing as well — you have to rush from pole to pole, giving each one a bit of extra spin by pressing the fire button to keep the crockery gyrating. The only gripe I have about this is that the plates don't actually shatter when they fall — they just disappear.

This game is a pleasant departure from the run of the mill shoot-'em-up, and is a refreshingly original use of 64 graphics capability.



Sorcery

- *Spectrum 48K*
- *£5.95*
- *Virgin Games*

★ ★ ★

A ONE-DIMENSIONAL Atic Atac — but no bad thing for all that. Virgin are, it must be said, producing a lot of good software now; they had a somewhat shaky start. This has attractive graphics, is a challenging test of your co-ordination, and is a fairly original idea. It might sound like an adventure game, but it has elements of, if not exactly shoot-'em-up, keep out of their way.

The earth has fallen into the Dark Ages. As is their wont, the evil Necromancer and his demonic servants have conquered the lands enslaving the people — which a lot of people would probably say was actually an improvement on three and a half million unemployed.

But being a naive idealist, you as the last of the great sorcerers feel obliged to travel outside the borders of your homeland to Stonehenge where your mates are locked up — a heavy number in fact, since the demonic servants are as opposed to you moving about as the police force is to flying pickets.

Can you free your friends before the earth is plunged into eternal darkness? By pressing Q to go left, A to go right — not the best choice of keys — and zero to fly, you can get past muscle-men rattling their chains and gruesome skull-like figures. You move through magic doors to get from screen to screen. On many of the screens you will find objects which may or may not be of use to you. Only one of the objects in the game will destroy the Necromancer. Stick the wrong one on the altar at Stonehenge and you will die. You could say this was a sorcery of endless fun.



Dinky Doo

- *Commodore CBM-64*
- *£7.95*
- *Software Projects*

★ ★ ★

"WILL YOU STILL need me, will you still feed me, when I'm 64." Thus the witty theme music for Dinky Doo. Another *Your Computer* contributor Damian McComb goes on to greater things with this whimsical odyssey through a house beset with horrors. At the core of this game is a warning against the hallucinogenic properties of cheese. Little Dinky-Doo has been doing some late-night scoffing of the aforesaid substance in sandwich form with the result that he awakes to a nightmare scene — snakes, skulls and all manner of undesirables are drifting through his domicile. The only way to allay the demons is to drink a nice glass of milk. All pretty wholesome stuff, huh?

Dinky-Doo appears on screen as a

(continued on page 57)

Star★chart

Cosmic Bounce

Commodore
Novelty:
£6.95
Calde Software:

★ ★ ★

Elements of breakout in this game which puts you in control of a plasmobile defending the vital energy source from attack by doovries, odd-looking fellows, wearing caps with propellers on their heads. You fire a ball of plasma which bounces around the screen destroying everything in its path. You can't fire again until you recapture it. Instructions come in French and German.

3D Space Wars

Dragon 32
Shoot-'em up
£6.95
Hewson Consultants

★ ★ ★

An excellent Dragon game. Okay it's in black-and-white but the hi-res graphics are excellent, and controlling your spacecraft really tricky as you nose through the void trying to push the Seiddab backwards into oblivion.

To every action there is an equal and opposite reaction and killing the inertia of a fast swing to the right with your port trusters is the first trick you learn. Once again, there is some very good stuff around for the Dragon.

Stargate

Dragon 32
Shoot-em-up
£7.95
Abacus Software

★ ★

Too much money for something that just doesn't compare with the new generation of hi-res and perspective programs that some of the more creative software houses have struggled to come up with.

You squat in a square at screen-centre, blasting away at aliens trying to leave the galaxy via the stargate.

Not a patch on 3D Space Wars by Hewson, or Pedro by Imagine.

(continued from page 55)

spherical blob with a fixed grin and slowly blinking eyes. The loveable little berk needs to be guided through the maze without touching the walls or bumping into any of the unwelcome guests.

The object of his quest is the hot milk on the opposite side of the screen. Once downed, the creatures turn into harmless cherries. Gulp these for extra points. If you gulp them all, you can head for a door which appears on the screen. This ushers you into the next part of the game. According to the documentation, this may be mum's room. More often, it isn't, and you are plunged into faster and more complex mazes.

In all fairness, when you compare this game with some of the graphic programs now becoming available for the CBM-64, the game itself is not as visually appealing as some Spectrum programs — the design seems rather watery. Interesting little touches, like the simulation of a Spectrum loading pattern have, however, been added. This is a good idea — there is something very inscrutable about the Commodore 64's presentation of a blank blue screen when it is loading.

SOFTWARE Shortlist





Beach-head

■ *Commodore CBM-64*
■ *£8.95*
■ *Access Software*

★ ★ ★

KUHN-LIN IS THE objective of your forces in this shoot-em-up. It has impressively good graphics — aircraft swoop overhead and peel off, accompanied by the roar of engines and your big gun pounds heavily away at them.

The opening sequence simulates an aerial reconnaissance of enemy territory. You can choose either to take your 10-ship fleet through a hidden passage and catch the enemy offguard, or try a frontal assault. This is done by steering your fleet — represented by mobile cross-hairs on the screen — in the direction you wish to go.

The hidden passage is mined — steer around these — and avoid torpedoes zipping across the screen. Controls are a little strange at first because the ship moves through a three-quarter view rather than a straight plan view — this can lead to a few disasters. If you get through the straights without too much attrition, you then confront an attack from carrier-borne aircraft, as described. Having survived this and established your beach-head, you are then presented with a side view of your tanks lined up on the seashore. You steer them one by one around the tank-traps and anti-tank defences until you are confronted by the enemy's final big gun. This is presented in a head-on view with white spots appearing on it to indicate the vulnerable areas.

You get about three or four goes, before the gun trains on you and inevitably destroys you. As with all strategy, success in this game is about having enough of a force at all times to be able to withstand a certain percentage of attrition. Getting through the anti-tank course is no easy number, and if you only have one tank left by the time you reach the big gun stage, you are never going to see that bit of the program where a hand emerges from the top of the turret waving a white flag.

This American-originated program is certainly one of the best uses of the CBM-64's inestimable sound and graphic capacity I have seen to date.

Olympimania

■ *Spectrum 48K*
■ *Automata*
■ *£6.00*

★ ★

CASHING IN ON THE wave of apathy sweeping the country as regards the 1984 Olympic games in Los Angeles this year. Automata have rushed out another Pi-game. Tracing its line of descent from games like Jumping Jack, the Pi-man competes in all five events of the Olympic Games. He races against time to achieve world records in the Pi Jump, the Alpi skiing, the Steepichase, the Pitathlon, and the Butterpi.

All of these events consist of jumping over things. In the first game, he is jumping over pi-signs, in the second game, he ski-jumps over pine-trees, in the Steepichase over pi-signs, over musclemen in the Pitathlon. There is original departure from this in the Butterpi which is a swimming race viewed from overhead.

There is an octopus in your lane, and you have to punch 8 to dive, leaving a swirl of ripples on the surface. Lurch the office parrot — at least they think he's a parrot — makes a sudden appearance in some of the games dropping steroids on the track — at least they think they're steroids. Other sportsmen are always elbowing you out of the way, and even alligators show up in the swimming pool as the game progresses.

The worst thing about this latest presentation is the PiLand International Anthem on the back. While we may look forward to a future free from tsetse flies, piles and hangovers, using a Martin Luther King voice-over is just plain bad taste in this context. It's an averagely enjoyable game but as regards commercial popularity we suspect Malcolm X's "No Sell-out" would have been a better track to put on the back.

NEWS

oaeo rssu tttt h h

The crystal ball

MP Software are marketing three highly enjoyable Adventures for the BBC B — Firienwood, Blue Dragon and Survivor. Pure text, they offer plenty of puzzles to test your Adventuring ability.

Gilsoft, Welsh wizards of The Quill, have brought out their Gold Collection for the 48K Spectrum. A series of Adventures all written with The Quill by different authors, the collection includes Africa Gardens, Magic Castle, Mindbender, Barsak and Dwarf, Devil's Island, Diamond Trail, and Spyplane. Gilsoft are also bringing out The Quill for the Commodore 64.

A helping hand

In case you have a little difficulty in finding out how to start time travelling in Level 9's Lords of Time, try this trio of hints. They're written backwards, as usual.

To get inside the time machine:

NI NEHT KCOLC DNIW

To visit, say, time zone 3:

3 GOC NRUT

To leave the time machine:

HTRON NEHT MULUDNEP HSUP

For those having difficulties with Interceptor's Heroes Of Karn, here's a bit of advice.

Can't get at the pirate because he hides in a crevice in the cave wall?

NAC OUY — ITI TEGROF HSINIF EHT TA MIH TEG YLNO

Blocked by a Barrow Wight?

ELBIB HTIW THGIW KCATTA

Stuck in the dungeon?

DRAUG OT GAB EVIG

That's all the help for this time from, yours in Adventure adversity.

QUEST Corner

Our man with the brass lamp and the key to a thousand mysteries sheds light on new adventure programs. Lost? Never fear, Hugo North is here.

Lords of Time

- *BBC B/CBM 64/Atari*
- *£9.90*
- *Level 9 Computing*

THE NUMBER NINE looms large in this orginal adventure from those masters of the art at Level 9 Computing. No only do you have to collect nine rather strange objects — a dragon's wing, a teardrop and a jester's cap are hardly household articles — you must also travel through time, searching in nine different periods to find them.

Evil has arisen in the shape of a conclave of Timelords — guess how many — who are trying to remould history in their favour. Father Time, a picturesque figure, allots to you the awful responsibility of journeying through Time to collect nine, vital symbolic objects. Only with these can the rent fabric of History be repaired.

Prepare yourself for a race through the ages — the sands in the hourglass are running away. You won't suffer from jet lag but you might find yourself dazzled as you search in the Ice Age, the Stone Age, through Roman and Viking times and on to Mediaeval and Turdor Periods. Catch your breath in the Present before experiencing the Future and the Far Future.

As with all Level 9 adventures, what you get is an engaging and atmospheric plot and beautifully detailed text with bags of locations, objects and puzzles. There are well over 200 places to explore, 750 messages to enjoy, and 80 objects to play around with. The vocabulary is similarly extensive, over 200 words.

If you think with all that lot you're going to get a slow response, think on — response to your every command is immediate, the whole program having been written in machine code.

The adventure was conceived and designed by Sue Gazzard of Harrow and it's the first she's produced. All I can say is — more, please, Sue. The actual programming was done by Pete Austin, Level 9's machine-code wizard.

Play Lords of Time and get nine times the pleasure!



Legion

- *BBC B*
- *£7.95*
- *Software Projects*

LEGION SETS YOU down in Roman times. Your aim is to obtain warrior status from Caesar in order to go off a'hunting for treasure in the pyramids of Egypt.

Text only, Legion kicks off in a centurion's house. First problem is overcoming the rats whose bite will infect you with the Black Death. Once in the street, you'll have to watch where you're heading — ending up in the gladiatorial arena with no weapon is not likely to increase your chances of winning Caesar's acclaim.

A fairly simple but entertaining adventure, one probably more suited to the apprentice traveller.



Altair 4

- *CBM 64*
- *£5.99*
- *Voyager Software*

ALCATRAZ, DEVIL'S ISLAND and Sing Sing are not likely to be top of your list of ideal holiday resorts. Altair 4, a remote planet, won't be either since for generations every other planet in the galaxy has sent its most dangerous criminals there.

Imagine your feelings then when your strato-cruiser is disabled in an argument with a meteor storm and your computer tells you the nearest place for an emergency landing is the dreaded penal planet, Altair 4.

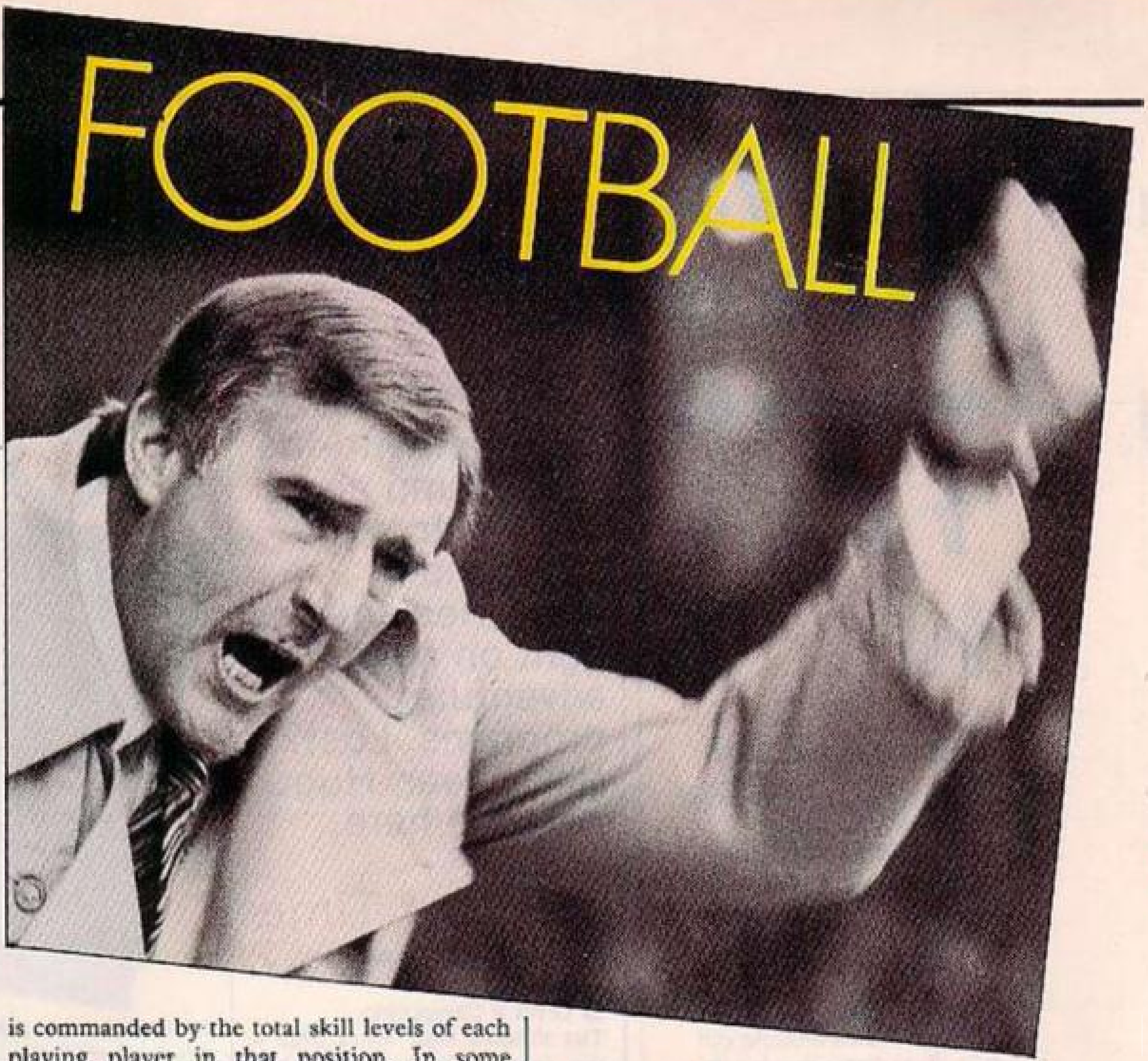
This text-only adventure starts with your having landed on the planet. Now you must find how to get out of your craft and go in search of the necessary equipment to make the vital repairs. The question is — will you manage to avoid Mekon Monsters, Bug-Blyte Beasts and other marauding bands of the most unpleasant beings in the galaxy?

Exploring your ship, you will soon come across a strange, hairy creature slumped across a control console and snoring loudly. Friend or foe? If you can arouse it, you'll likely find an ally for this turns out to be none other than a giant furry Wookie. Nearby, you might find a cage of white mice but what purpose do they serve? — they definitely don't seem to want to come out of their cage.

Getting out of the ship is no doddle — there are four buttons controlling the airlock and these must be mastered before you can alight on the planet's surface. Having descended, you may be dismayed to find you're soon on the lip of a volcano, in which boiling, liquid mud bubbles and pops alarmingly.

With luck, you may find such obvious essentials as a lamp, phaser and rocket pack.

FOOTBALL



You'll be "over the moon, David" with Lee Carpenter's game.

THIS PROGRAM ALLOWS you to take charge of any one of 64 teams, and hopefully steer them to the top of the League, while winning as many FA cups as possible. This is achieved by putting together a balanced team, that is strong in both defence and attack. You can strengthen your team by plunging into the transfer market and buying players with high skill levels.

You are initially given the choice of starting from a previoius position that has been saved on tape or starting from a new position. If you start from a new position you are given the choice of which team you want, and then your team is sent to division 4 and the beginning of a new season. You are randomly given a 12 man squad — 11 players, and one substitute — which will play your first game.

After the information has been loaded into the computer — either from tape or generated by the computer — you are given a menu and a choice of what you want to do next. The choices are to sell players, where you can sell an unwanted player — or just see your squad. You can obtain a loan from the bank — interest = 20 per cent — print out your current status — 0 until at least one season has been played — print out all the scores of matches played so far on the season, see the current league table — these last two only available when at least one match has been played in the season — and the chance to save the game so that you can continue the game again at a later date.

Shocked and stunned

When you wish to continue the game, you press f0 and your next opponent is chosen. You only play each team twice in a season — once at home and once away. You then go on to the main part of the game, where you choose your team, and play the game. A set of statistics are shown, for both you and your opponents, and these are what contribute directly to the score of the match. The values are in five categories, energy which is the total energy of the team divided by 11; morale which changes with the scores of previous matches, defence, midfield and attack, which is commanded by the total skill levels of each playing player in that position. In some football manager games on the market, these are compared directly, and these determine the score, but sometimes give an unlikely score.

For example, if defence of the teams is 19 and 20, and attack in 4 and 5 then it would be likely that there would only be one goal, if any in the match, regardless of other values, but some games could give a four or five goal game, as defence is not compared with attack. This is a major fault, but with this FM game, they are compared, and I will show how they are compared later. To change your team, press 'C' and your squad will be shown.

The letter to the far left is that player's unique player number, and that is what is used to bring him into the team, drop him, or sell him. The next letter is his position — D = defence, M = midfield, A = attack — there is also a colour scheme that allows you to what position they are in with ease. The energy of the player is headed, and so is the skill, and the value of the player that you should except for the player if you were selling or buying him.

The last column is what status the player is in — key at the top of the screen. To bring a player into the team, you press his player letter, and the screen will be changed. If there are more than 11 players in the team, you will have to take a player out, in the same manner. When you have a team that you are satisfied with, you press f0 and then you are asked for the substitute. A sub is not a necessity, but is handy for a change at half-time, i.e., if the substitute was a defender, if you were winning at half time, by bringing on a defender will help to try to preserve that lead.

You are then given the new statistics, and if you are satisfied that you do not want to change your team again, press f0, and the match will start. The latest score is shown, and any score is shown, and the score changed. There is a half-time, where you will

```
50*FX200,1
60MODE7
70PROCstart
80REPEAT:REPEAT:REPEAT
90PROCmenu
100IF H%=65 PROCsell
110IF H%=66 PROCloan
120IF H%=67 PROCtable
130IF H%=68 PROCscores
145IF H%=69 PROCstatus
146IF H%=70 PROCkeep
150UNTIL H%=90
160PROCchoose
170PROCgame
180IF L%=1 PROCresults:PROCtable
190PROCpayment
200PROCbuy
210UNTIL I%=30 AND M%=0
220PROCendseason
230UNTILFALSE
240DEFPROCstart
250CLS:VDU23;8202;0;0;0;
255DIM A$(64),B$(24),C$(30),D$(2),A(24),B(24),C(24),
D(14),E(16),F(16),G(16),H(2),J(16),V(16)
260*KEY0 Z!M
270C$="DMFI SP":G(0)=-1
280P%=RND(-TIME):FOR H%=1 TO 24:READ B$(H%):NEXT
290P%=131:FOR H%=1 TO 2:PRINT CHR$(141);CHR$(P%);TAB
(10);"FOOTBALL SUPREMO":P%=P%-1:NEXT
300PRINT''TAB(5);CHR$129;"Do  you  wish   to  start"
''TAB(5);CHR$129;"from a  new  position";CHR$130;"(N)"
''TAB(5);CHR$129;"or a  saved  position";CHR$131;"(S)"
310REPEAT:U%=(GET AND &DF):UNTIL U%=78 OR U%=83
320IF U%=83 PROCload:GOTO 430
330N%=4:FORH%=1TO64:READA$(H%):NEXT:FORH%=1TO24:A(H%
)=RND(5):B(H%)=INT(RND(5)+15):NEXT
340I%=0:M%=1:W%=150000:Y%=0:Z%=0:K%=15:R%=20:B1%=1
350FORH%=1TO12
360P%=INT(RND(24)):IF C(P%)=0 C(P%)=4 ELSE 360
370NEXT:C(P%)=3
380H%=1
390IF H%=65 THEN 380
400CLS:PRINT'TAB(9);CHR$131;"CHOICE OF TEAMS"':FOR P
%=H% TO H%+7:PRINT TAB(4);CHR$(133);FNF(P%);" "STRING$
(8,". ");A$(P%)':NEXT:PRINT'CHR$131;"  Which team do y
ou wish to choose";CHR$130;"f0"'CHR$131;"for further c
hoice."
410PRINT'CHR$134;:INPUT""A$:IFA$="Z" THEN H%=H%+8:GO
TO 390 ELSE Q%=VAL(A$):IF Q%<H% OR Q%>H%+7 THEN 400
420A$=A$(49):A$(49)=A$(Q%):A$(Q%)=A$:Q%=49:FORH%=1TO
16:J(H%)=1:NEXT:J(1)=6
430ENDPROC
440DEFPROCmenu:*FX15
450CLS:PRINT''CHR$133;"KEY";TAB(22);"ACTION"''
```

ELECTRON/BBC

SUPREMO



get the opportunity to bring on yoiur chosen substitute. You then play the second half, and then the result will be shown. If it was an FA cup, the outcome is shown, and if a replay is needed the game will be replayed, and you will have the chance to change your team. If it was a league match, other league matches will be displayed, and then the new league table will be displayed.

If you have less than 16 players in your squad, you will get the opportunity to buy a player. His position will be shown, along with your bank balance, his skill, energy and value. You then have the chance to bid for him. If your bid is refused, or you type f0, you will return to the menu at the beginning of the program. If, however, your bid is accepted, your bank balance is adjusted, and that player is included in your squad.

At the end of the season — when 30 league games have been played, and you are either out of the cup, or have won it outright, all your league game results will be displayed (opponent, venue, score with your score first.)

We was robbed

Any necessary changes in divisions will be made (Top two go up except in division one and bottom two go down except in division four), and hopefully you will be one division nearer that first division title.

The scores in the matches that you play are dependent on the five categories and that of your opponents. All this information is split down into two values — held in D(7), D(8) for you and D(13) and D(14) — for your opponents.

These are for the total defence and total attack, and are compared with the opposition's opposite i.e. your defence is compared with your opponents attack and vice-versa. The defence is the whole of the defence and half of the energy, morale and midfield. Attack is calculated on the same format — attack plus half energy, morale, and midfield. During the game these are compared and if you attack is much greater than the other team's defence, you are likely to score, but if your attack is a lot lower than his defence, it is unlikely that you will score.

```
460PRINTCHR$131;" A";STRING$(16,".");"sell or list p
layers"'''CHR$131;" B";STRING$(16,".");"Obtain a loan"
'''CHR$131;" C";STRING$(16,".");"Print league table"''
470PRINTCHR$131;" D";STRING$(16,".");"See previous s
cores"'''CHR$131;" E";STRING$(16,".");"See status"'''C
HR$131;" F";STRING$(16,".");"Save game"'''TAB(10);CHR$
134;"or f0 to continue.";:H%=GET AND &DF
480ENDPROC
490DEFPROCsell
500CLS:PROClist
510PRINT'CHR$131;"Who do you wish to sell"'CHR$131;"
(f0 to continue)":REPEAT:A$=CHR$(GET AND &DF):UNTIL A$
>="A" AND A$<="X" OR A$="Z"
520IF A$="Z" THEN ENDPROC
530U%=ASC(A$)-64:CLS:IF C(U%)=0 THEN PRINT 'CHR$134;
"You do not have ";B$(U%)'CHR$134;"In you team":GOTO 5
70 ELSE IF C(U%)=1 THEN PRINT 'CHR$133;"There are no o
ffers for ";B$(U%)'CHR$133;"Due to the fact that he is
 injured.":GOTO 570
540P%=5000*(5-N%)+5000*A(U%):P%=INT(P%+RND(P%/10)-RN
D(P%/10))
550PRINT 'CHR$131;"Do you except '";P%;" from ";A$(R
ND(64))'CHR$131;"for your player ";B$(U%)''CHR$133;"Pl
ease answer (Y/N)"
560REPEAT:A$=CHR$(GET AND &DF):UNTIL A$="Y" OR A$="N
":IF A$="Y" W%=W%+P%:C(U%)=0:PRINT''CHR$133;B$(U%);" h
as been sold." ELSE C(U%)=RND(2)+1:PRINT CHR$133;B$(U%
);" is still a ";A$(Q%);" player."
570PRINT''CHR$129;"Press";CHR$131;"RETURN";CHR$129;"
to continue.":REPEAT:UNTILGET=13:ENDPROC
580DEFFNA IF L%<>1 THEN =FNI ELSE IF G(A1%)=0 AND I%
<>0 THEN =RND(10)+10 ELSE IF G(A1%)=0 THEN =RND(10)+6
ELSE =RND(G(A1%)/I%*3)+10
590DEFFNB(H%) =D(1)+B(H%)
600DEFFNC(H%) =D(((H%-1) DIV 8)+3)+A(H%)
610DEFFND(H%) =INT(D(H%)+D(H%+1)/2+D(H%-2)/2+D(H%-1)
/2)
620DEFFNE(H%) =INT(D(H%)+(D(H%-1))/2+(D(H%-4))/2+(D(
H%-3))/2)
630DEFFNF(H%) A$=STR$(H%)
635 =STRING$(3-(LEN(A$))," ")+A$
640DEFFNI H%=INT(RND(I%/3)+15):IF H%<=20 THEN =H% EL
SE =H%
660DEFFNG IF (I% DIV 4)<7 THEN =STR$(I% DIV 4) ELSE
IF I%=28 ="SEMI - FINALS" ELSE = "FINALS"
670DEFFNH IF L%=1 THEN ="League match" ELSE ="F.A. C
up match       "+CHR$133+"round : "+FNG
680DEFPROCgame
690PROCredo
700FOR P%=8 TO 12:D(P%)=INT(FNA)+2:IF D(P%)>20 D(P%)
=20
701NEXT
710D(13)=FND(10):D(14)=FNE(12)
720PROCnewvalues
```

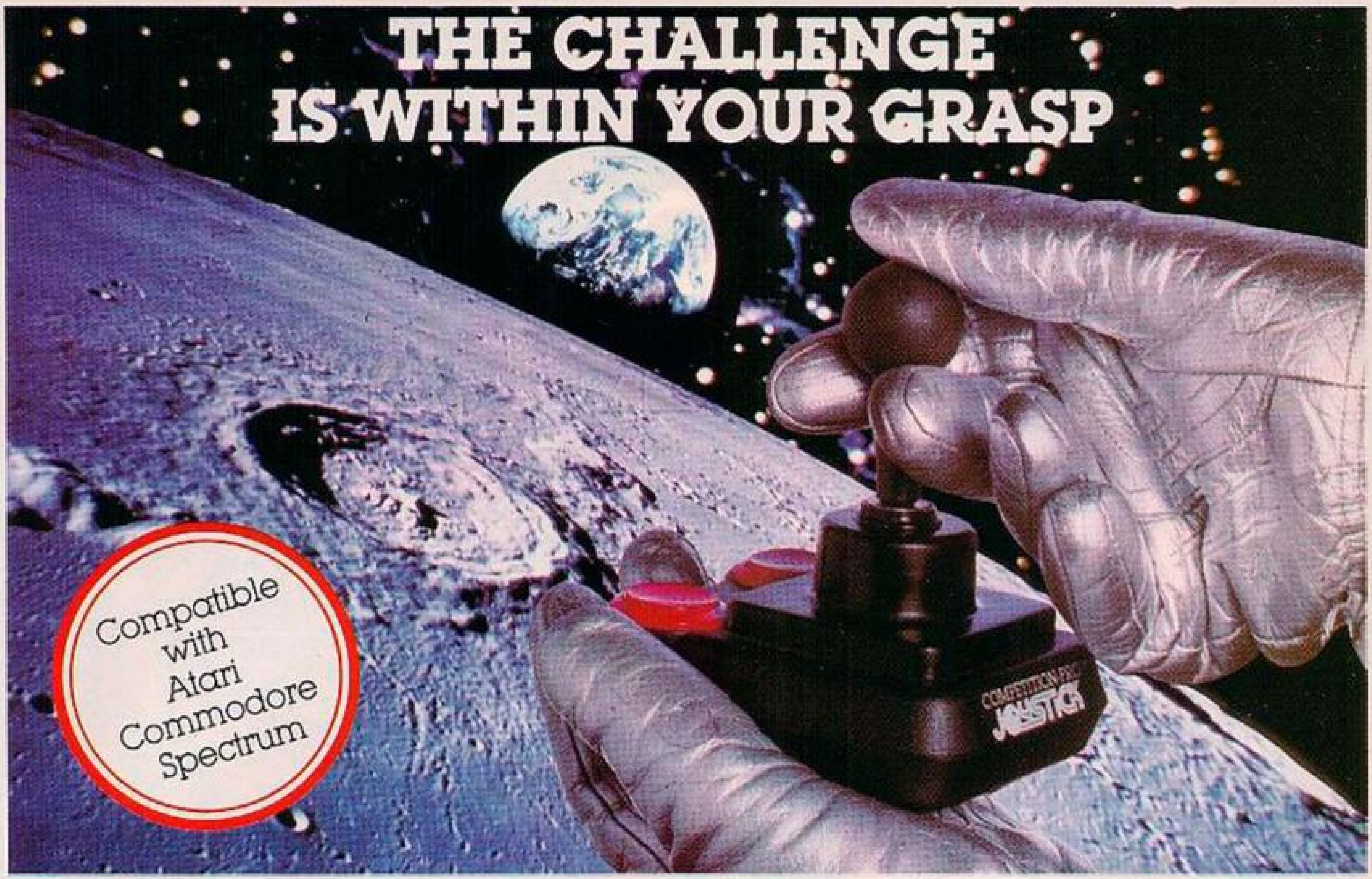
(continued on next page)



(continued from previous page)

```
730CLS:PRINT CHR$(134);TAB(13);A$(O%);TAB(25);A$(S%)''CHR$131;"ENERGY";TAB(15);FNF(D(1));TAB(25);FNF(D(8))'CHR$131;"MORALE";TAB(15);FNF(D(2));TAB(25);FNF(D(9))
740PRINT'CHR$131;"DEFENCE";TAB(15);FNF(D(3));TAB(25);FNF(D(10))''CHR$131;"MIDFIELD";TAB(15);FNF(D(4));TAB(25);FNF(D(11))''CHR$131;"ATTACK";TAB(15);FNF(D(5));TAB(25);FNF(D(12))
750PRINT''CHR$130;"There have been ";X%;" players picked ,":IF U%=0 THEN PRINT CHR$130;"and no substitute" ELSE PRINT CHR$130;"and also a substitute"
760PRINT'CHR$129;"'C' to change the team ,"'CHR$129;"and 'fo' to play the game.":*FX15
770REPEAT:A$=CHR$(GET AND &DF):UNTIL A$="C" OR A$="Z":IF A$="C" PROCchange:GOTO 720
780A$="1st half":CLS:H(1)=0:H(2)=0:PROCsheet:PROCwait
790REPEAT:IF RND(H%)>9 PROCchance
800UNTIL RND(H%)<3
810PROChalf
820A$="2nd half":CLS:PROCsheet:PROCwait
830REPEAT:IF RND(H%)>10 PROCchance
840UNTIL RND(H%)<4
850X%=A1%:U1%=H(A3%):P1%=H(A4%)
860PROCend
870IF L%=2 GOTO 910
880F(1)=F(1)+U1%:E(1)=E(1)+P1%:F(A1%)=F(A1%)+P1%:E(A1%)=E(A1%)+U1%:I%=I%+1
890IF U1%=P1% G(1)=G(1)+1:G(A1%)=G(A1%)+1 ELSE IF U1%>P1% G(1)=G(1)+3 ELSE G(A1%)=G(A1%)+3
900GOTO 960
910IF P1%>U1% PRINT "You are out of the cup ......":M%=0:T%=(I%+2) DIV 4:GOTO 940
920IF P1%=U1% PRINT "There is a replay :-":H%=A3%:A3%=A4%:A4%=H%:A$=D$(1):D$(1)=D$(2):D$(2)=A$:H(1)=0:H(2)=0:A$=GET$:GOTO 690
930IF I%<30 PRINT "You are through to the next round" ELSE FOR A2%=1TO2:PRINT TAB(4,10+A2%);CHR$131;CHR$157;CHR$132;CHR$141;CHR$136;"YOU HAVE WON THE CUP    ";CHR$156:NEXT:M%=0
940*FX15
950A$=GET$
960ENDPROC
970DEFPROCchance
980IF RND(2)=1 THEN 1010
990IF RND(D(14))-RND(D(6))>0 H(A4%)=H(A4%)+1:PROCgoal
1000GOTO 1030
1010IF RND(D(7))-RND(D(13))>0 H(A3%)=H(A3%)+1:PROCgoal
1020*FX15
1030ENDPROC
1040DEFPROCtable:IF I%=0 PROCnomatch:ENDPROC
1050CLS:PRINT'CHR$130;"     TEAM";TAB(22);"F";TAB(26);"A";TAB(29);"Pts";TAB(35);"GD"'
1060FORU%=1 TO 16:V(U%)=0:NEXT
1070FORU%=1 TO 16:X%=0:FORP%=1 TO 16
1080IF (G(P%)>G(X%) OR (G(P%)=G(X%) AND ((F(P%)-E(P%))>(F(X%)-E(X%))))) AND V(P%)=0 THEN X%=P%
1090NEXT:V(X%)=U%:PRINT CHR$131;FNF(U%);" ";A$(X%+(N%-1)*16);TAB(20);FNF(F(X%));TAB(24);FNF(E(X%));TAB(28);FNF(G(X%));TAB(34);FNF(F(X%)-E(X%))
1100NEXT:PRINT'CHR$134;"Your position is ";V(1);" after ";I%;" matches.":*FX15
1110A$=GET$:ENDPROC
1120DEFPROCchoose
1130A2%=0:IF (I% MOD 4=0 AND I%>0 AND M%=1 AND L%=1) OR (I%=30 AND M%=1) THEN L%=2 ELSE L%=1
1140IF L%=2 THEN GOTO 1170
1150REPEAT:P%=RND(2)+1:S%=RND(16):UNTIL J(S%) MOD P%<>0:J(S%)=J(S%)*P%:A1%=S%:S%=(N%-1)*16+S%
1160GOTO 1180
1170S%=(9-I%/4)*8-RND(8):IF S%=O% THEN 1170
1180IF P%=2 A3%=1:A4%=2:D$(1)=A$(O%):D$(2)=A$(S%) ELSE A3%=2:A4%=1:D$(1)=A$(S%):D$(2)=A$(O%)
1190CLS:PRINT''TAB(8);CHR$133;"This is a ";CHR$134;FNH''TAB(4);CHR$131;D$(1);TAB(19);"v.  ";D$(2)'':IF L%=1 AND I%>0 PRINTCHR$131;"Who is ";V(A1%);" in division ";N%
1200PRINT'CHR$131"You are playing";:IF P%=2 PRINT" home." ELSE PRINT" away."
1210*FX15
1220A$=GET$:CLS
1230ENDPROC
1240DEFPROCloan
1250CLS:PRINT'CHR$131;"You have a total of `";W%''CHR$131;"And a `";Y%;" loan."''CHR$133;"How much do you wish to borrow"'CHR$133;"Please ensure that it is `1000's"'
1260PRINT CHR$129;:INPUT""X%:IF X%<0 OR X% MOD 1000<>0 THEN 1250
1270IF X%=0 THEN 1320
1280IF X%+Y%>100000*(5-N%) PRINT ''CHR$130;"The bank will not allow a loan of"'CHR$130;"`";X%+Y%;".The most in division ";N%'CHR$130;"that they will lend is `";100000*(5-N%):GOTO1310
1290Y%=Y%+X%*1.2:Z%=Y%/20:W%=W%+X%:PRINT''CHR$130;"The bank has agreed to your request for";CHR$130;"`";X%;" which makes your loan `";Y%'CHR$130;"and your weekly repayments of `";Z%
1300PRINT'CHR$131;"You now owe `";W%
1310A$=GET$
1320ENDPROC
1330DEFPROClist
1340P%=0:U%=0:A%=0
1350FORX%=1TO24:IF C(X%)>0 A%=A%+1
1360NEXT
1370VDU28,0,24,39,A%+4:CLS:VDU26
1380PRINT TAB(0,1);CHR$131;"(I=INJURED , S=SUBSTITUTE , P=PLAYING)"'
1390PRINTCHR$133;TAB(16);"energy skill    `"
1400FORX%=1TO24:IF C(X%)=0 THEN 1430
1410PRINT CHR$134;CHR$(X%+64);CHR$(129+((X%-1) DIV 8));" ";MID$(C$,((X%-1) DIV 8)+1,1);" ";B$(X%);TAB(17);FNF(B(X%));TAB(25);A(X%);TAB(29);5000*(5-N%)+5000*A(X%);TAB(35);MID$(C$,(C(X%)+3),1)
1420IF C(X%)=3 THEN P%=P%+1 ELSE IF C(X%)=4 THEN U%=U%+1
1430NEXT
1440ENDPROC
1450DEFPROCredo
1460FORH%=1TO24
1470IF C(H%)=0 THEN 1530
1480IF C(H%)<3 THEN B(H%)=B(H%)+10
1490IF C(H%)=4 THEN B(H%)=B(H%)-1
1500IF B(H%)>20 THEN B(H%)=20 ELSE IF B(H%)<1 THEN B(H%)=1
1510IF C(H%)=1 AND B(H%)>RND(15) THEN C(H%)=2
1520IF B(H%)<12 AND RND(B(H%))<=2 THEN C(H%)=1
1530NEXT:ENDPROC
1540DATA Shilton,Clemence,Neal,Hansen,Osman,Butcher,McQueen,Kennedy,Keegan,Robson,Whelan,Dalglish,Souness,Lee,Hoddle,Rix,Rush,Stapleton,Davis,Withe,Brazil,Crooks,Nicholas,Francis
1550DATALiverpool,Arsenal,Tottenham,Ipswich,Man. Utd,Luton,Coventry,Stoke,Q.P.R.,Norwich,Wolves,Leicester,Watford,Ast.Villa,West Ham,Everton
1560DATA Brighton,Man.City,Fulham,Chelsea,Sheff.Wed,Cambridge,Derby,Newcastle,Swansea,C.Palace,Cardiff,Charlton,Leeds,Blackburn,Barnsley,Oldham
1570DATA Wimbledon,Burnley,Bolton,Carlise,Walsall,Aldershot,Millwall,Oxford,Southend,Hull,Reading,Rotherham,Bradford,Exeter,Grimsby,Plymouth
1580DATA Southport,Brentford,Halifax,Tranmere,Torquay,Rochdale,Swindon,Port Vale,Wrexham,Orient,Preston,Newport,Crewe,York,Bury,Wigan
1590DEFPROCchange
1600CLS
1610PROClist
1620PRINT'CHR$133;"There are ";U%;" players picked":IF P%=1 THEN PRINT CHR$133;"and a substitute." ELSE PRINT CHR$133;"but no substitute."
1630IFU%>11 THEN GOTO 1770
1640PRINTCHR$134;"Who to include in team";CHR$131;"fo";CHR$134;"to continue."
1650A$=GET$:IF A$="Z" THEN GOTO 1690
1660H%=ASC(A$)-64:IF H%<1 OR H%>24 THEN GOTO 1650
1670IF C(H%)<2 OR C(H%)=4 THEN 1650
1680C(H%)=4:GOTO1610
1690PROClist
1700PRINT'CHR$134;"Enter substitutes number  "'CHR$134;"or";CHR$133;"fo";CHR$134;"to continue.  "
1710A$=GET$:IF A$="Z" THEN GOTO1790
1720H%=ASC(A$)-64:IF H%<1 OR H%>24 THEN GOTO 1710
1730IF C(H%)<2 THEN GOTO 1710
1740FORP%=1TO24:IF C(P%)=3 THEN C(P%)=2
1750NEXT:C(H%)=3
1760GOTO 1690
1770PRINTCHR$134;"Who do you want to take out of the team";
1780REPEAT:A$=GET$:H%=ASC(A$)-64:UNTILH%>0 AND H%<25:IF C(H%)<>4 THEN 1780 ELSE C(H%)=2:GOTO 1610
1790ENDPROC
1800DEFPROCsheet
1810FORP%=1TO2:PRINT TAB(10,2+P%);CHR$141;CHR$134;"MATCH IN PROGRESS"''''CHR$131;CHR$141;D$(1);TAB(20);H(1)''CHR$131;CHR$141;D$(2);TAB(20);H(2)
1820PRINT''TAB(4,18+P%);CHR$141;CHR$134;A$:NEXT:ENDPROC
1830DEFPROChalf:*FX15
1840CLS:PRINT''CHR$131;"At half-time the score is :"''CHR$133;D$(1);" "H(1);"      ";D$(2);" ";H(2)
1850PRINT'''CHR$134;"If you wish to bring on your"'CHR$134;"substitute press 'S' otherwise"'CHR$134;"Press f0 to continue"
```

(continued on page 65)



With the vast range of games now available for home computers each holds a different challenge. Now there are three Competition-Pro Joysticks in the Kempston range that will come to your aid and improve your playing capabilities. Your movements will become quicker, with finger poised over the fire button at the ready, your scores will be out of this world. Playing will be so much easier! If you're serious about the challenge your computer presents then you shouldn't be without a Kempston Competition-Pro Joystick.

NEW

PRO 1000

Ergonomically designed handle and base • 8-way arcade quality leaf switches for precision control • 5 foot cable to allow more comfortable playing positions • Rubber return for smooth control • Rubber protector pads on base • Base fire bar for left or right hand control •

NEW

PRO 3000

All the winning features of the Pro 1000 plus top fire button for precision one handed play • trigger fire button for true arcade realism •

PRO 5000

Again all the winning features of the Pro 1000 but incorporating true craftsmanship plus large 1¼" control knob for comfortable play • Unique tapered shaft for maximum sensitivity • Dual independent fire buttons • Nylon covered steel shaft for maximum robustness

KEMPSTON JOYSTICK INTERFACE FOR THE ZX SPECTRUM

Allows the use of any Atari/Commodore type joystick with the popular ZX Spectrum computer. With well over 100 games on the Spectrum now compatible with the joystick this is a must for any Spectrum owner who wants the power of a joystick added to the power of the Spectrum. Simply plugs into the edge connector at the back of the Spectrum. No modifications necessary.

Some games you can buy were produced before Joysticks were available for the ZX Spectrum. With the aid of Kempston conversion tapes these games can now be played with any of the Kempston range of joysticks.





TRADE ENQUIRIES WELCOME

Most items are available from W H Smith, Boots, Spectrum Computer Centres and good computing shops or direct from:

KEMPSTON MICRO ELECTRONICS LTD

Unit 30 Singer Way, Woburn Road Industrial Estate, Kempston, Bedford, MK42 7AF. Tel: (0234) 856633 Telex: 826078 KEMPMI G

(continued from page 62)

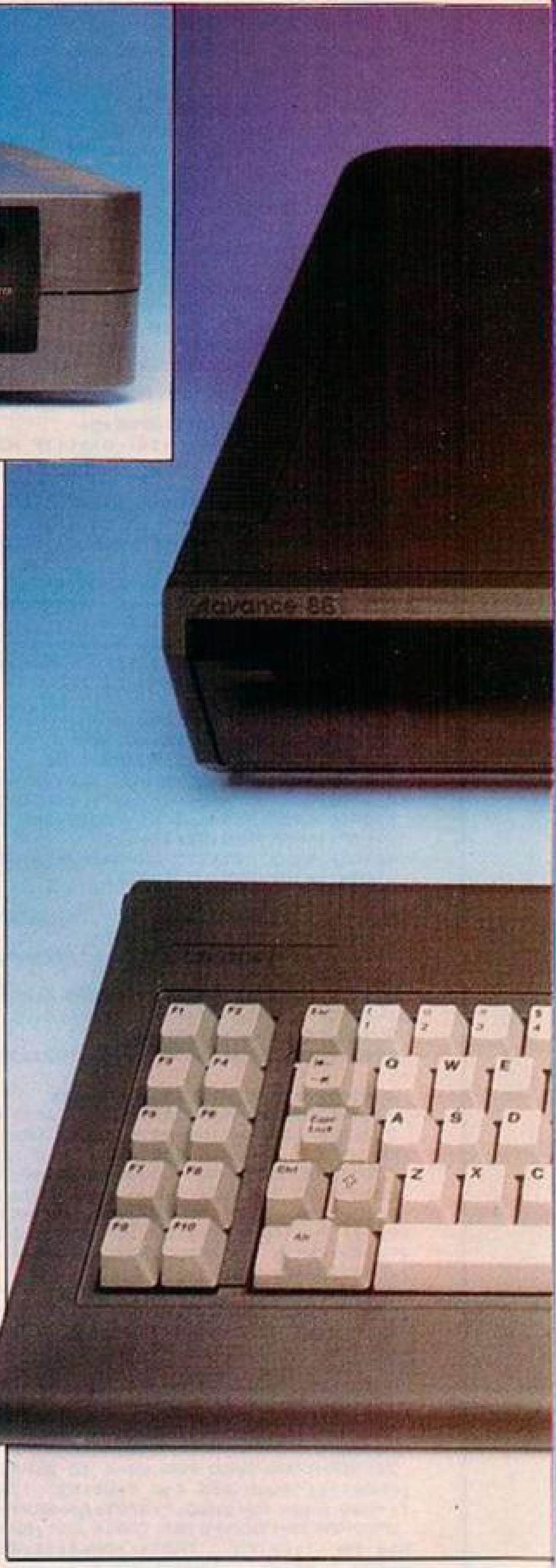
```
1860REPEAT:A$=GET$:UNTIL A$="Z" OR A$="S":IF A$="Z" T
HEN GOTO 1930
1870CLS:PROClist:PRINT'CHR$134;"Who do you wish to ta
ke off ?"'CHR$134;"or f0 if you do not want to bring"'
CHR$134;"on your substitute"
1880REPEAT:A$=GET$:P%=ASC(A$)-64:UNTIL (P%>0 AND P%<2
5) OR P%=26:IF P%=26 THEN GOTO 1930
1890IF C(P%)<>4 THEN GOTO 1880
1900FOR U%=1TO24:IF C(U%)=3 THEN C(U%)=4
1910NEXT:C(P%)=3
1920PROCnewvalues
1930ENDPROC
1940DEFPROCnewvalues
1950FOR P%=1 TO 7:D(P%)=0:NEXT:X%=0:U%=0:D(2)=K%
1960FOR P%=1 TO 24:IF C(P%)=4 THEN D(1)=FNB(P%):D(((P
%-1) DIV 8)+3)=FNC(P%):X%=X%+1 ELSE IF C(P%)=3 U%=P%
1970NEXT:D(1)=INT(D(1)/11):FOR P%=2 TO 5:IF D(P%)>20
D(P%)=20
1980NEXT
1990D(6)=FND(3):D(7)=FNE(5)
2000H%=D(7)-D(13)+D(14)-D(6):IF H%<10 THEN H%=15
2010ENDPROC
2020DEFPROCend
2030CLS:PRINT ''CHR$131;TAB(10);"FINAL SCORE"''CHR$13
3;D$(1);" ";H(1);"      ";D$(2);" ";H(2)''
2040IF U1%>P1% THEN K%=(20-K%)/2+K% ELSE IF U1%<P1% T
HEN K%=INT(K%/2)+1
2050IFV(1)=0 THEN V(1)=RND(16)
2060IF L%=2 THEN A2%=A2%+RND(500)+500*I%/2 ELSE A2%=(
17-V(1))*RND(400)+500*(5-N%)
2070PRINTCHR$130;"Gate Receipts = '";A2%''
2080IF L%=1 THEN C$(I%+1)=STR$(S%)+","+STR$(A3%)+"."+
STR$(H(A3%))+STR$(H(A4%))
2090ENDPROC
2100DEFPROCresults:*FX15,0
2110FORP%=1TO16:V(P%)=0:NEXT
2120V(1)=1:V(A1%)=1:FORP%=1TO7
2130REPEAT:X%=RND(16):UNTILV(X%)=0:V(X%)=1
2140REPEAT:H%=RND(16):UNTILV(H%)=0:V(H%)=1
2150IF G(X%)<I%*1.5 S%=RND(2*I%) ELSE S%=G(X%)
2160P1%=INT(RND(S%/I%+3))
2170IF G(H%)<I%*1.5 U%=RND(2*I%) ELSE U%=G(H%)
2180U1%=INT(RND(U%/I%+3))
2190V(H%)=1:V(X%)=1
2200PRINT'CHR$134;A$((N%-1)*16+X%);TAB(18);P1%;"  ";A
$((N%-1)*16+H%);TAB(36);U1%
2210F(H%)=F(H%)+U1%:F(X%)=F(X%)+P1%:E(X%)=E(X%)+U1%:E
(H%)=E(H%)+P1%
2220IF P1%>U1% G(X%)=G(X%)+3 ELSE IF U1%>P1% THEN G(H
%)=G(H%)+3 ELSE G(X%)=G(X%)+1:G(H%)=G(H%)+1
2230NEXT:A$=GET$:ENDPROC
2240DEFPROCbuy:U%=0:FORP%=1TO24:IF C(P%)>0 THEN U%=U%
+1
2250NEXT:IF U%=16 THEN ENDPROC
2260REPEAT:P%=RND(24):UNTIL C(P%)=0
2270CLS:FORU%=1TO2:PRINTTAB(2,U%);:VDU131,157,129,141
:PRINT"T R A N S F E R   M A R K E T   ";CHR$156:NEXT
2280X%=5000*(5-N%)+5000*A(P%):*FX15
2290PRINT'CHR$131;"Your bank balance is '";W%'
2300PRINT'':VDU131,157,129,141:PRINT TAB(4);MID$(C$,(
(P%-1) DIV 8)+1,1);TAB(10);CHR$132;B$(P%):VDU131,157,1
29,141:PRINT TAB(4);MID$(C$,((P%-1) DIV 8)+1,1);TAB(10
);CHR$132;B$(P%)
2310VDU131,157,132:PRINT"skill : ";A(P%);TAB(10);"Ene
rgy : ";B(P%);TAB(22);"Value : '";X%
2320PRINT''" ";CHR$132;CHR$157;CHR$131;"What is your
bid ( fo to continue ) ";CHR$156;CHR$132;CHR$157;CHR$1
31;:INPUT "Your bid '"A$:IF A$="Z" THEN GOTO 2390
2330H%=VAL(A$):IF H%<=0 THEN 2270
2340IFH%>W% THEN 2270
2350U%=INT(X%+RND(X%/10)-RND(X%/10))
2360CLS
2370IFH%<U% THEN FOR U%=1 TO 2:PRINTTAB(4,U%);CHR$130
;CHR$141;"Your bid for ";B$(P%)''TAB(4);CHR$130;CHR$14
1;"has been refused.":NEXT:A$=GET$:GOTO2390
2380FORU%=1TO2:PRINT TAB(4,U%);CHR$131;CHR$141;"Your
bid for ";B$(P%)''TAB(4);CHR$131;CHR$141;"has been acc
epted.";B$(P%)''TAB(4);CHR$131;CHR$141;"is now ";A$(Q%
);" player.":NEXT:C(P%)=2:W%=W%-H%:A$=GET$
2390ENDPROC
2400DEFPROCendseason
2410CLS:FORP%=1TO2:PRINTTAB(6);:VDU131,157,132,141:PR
INT"END OF SEASON.  ";CHR$156:NEXT
2420PRINT''CHR$133;"Press any key to conitnue":A$=GET
$:PROCscores:PROCtable:CLS:PRINT''
2430R%=R%+(8-V(1))*5+T%*5:B1%=B1%+1:FORP%=1TO16
2440IF V(P%)<3 AND N%<>1 THEN PRINT CHR$131;A$(P%+(N%
-1)*16);" have been promoted."':A$=A$((N%-2)*16+P%):A$
((N%-2)*16+P%)=A$((N%-1)*16+P%):A$((N%-1)*16+P%)=A$
2450IF V(P%)>14 AND N%<>4 PRINT CHR$134;A$(P%+(N%-1)*
16);" have been relegated."':A$=A$(N%*16+P%):A$(N%*16+
P%)=A$((N%-1)*16+P%):A$((N%-1)*16+P%)=A$
2460NEXT
2470IF V(1)<3 AND N%<>1 THEN N%=N%-1 ELSE IF V(1)>14
AND N%<>4 THEN N%=N%+1
2480PRINT'CHR$131;"NEW SEASON"''CHR$133;"Division ";N
%:Q%=(N%-1)*16+1
2490FORP%=1TO24:A(P%)=RND(5):B(P%)=15+RND(5):NEXT:FOR
P%=1TO16:V(P%)=0:J(P%)=1:E(P%)=0:F(P%)=0:G(P%)=0:NEXT:
```



```
J(1)=6:K%=15:I%=0:*FX15
2500A$=GET$:ENDPROC
2510DEFPROCkeep
2520CLS:FORP%=1TO2:PRINT TAB(10,3+P%);CHR$131;CHR$141
;"SAVING":NEXT:PRINT''CHR$130;"PLEASE PRESS ";
2530H%=OPENOUT("FM")
2540FOR P%=1TO64:PRINT #H%,A$(P%):NEXT
2550FORP%=1TO16:PRINT #H%,E(P%),F(P%),G(P%),J(P%),V(P
%),C$(P%):NEXT
2560FORP%=1TO24:PRINT #H%,A(P%),B(P%),C(P%):NEXT
2570PRINT #H%,I%,K%,M%,N%,Q%,W%,Y%,Z%,R%,T%,B1%
2580CLOSE#H%
2590ENDPROC
2600DEFPROCload
2610CLS:FORP%=1TO2:PRINT TAB(7,5+P%);CHR$131;CHR$141;
"Loading  information"'''CHR$141;CHR$131;TAB(9);"for F
OOTBALL MANAGER":NEXT
2620H%=OPENUP("FM")
2630FOR P%=1TO64:INPUT #H%,A$(P%):NEXT
2640FORP%=1TO16:INPUT #H%,E(P%),F(P%),G(P%),J(P%),V(P
%),C$(P%):NEXT
2650FORP%=1TO24:INPUT #H%,A(P%),B(P%),C(P%):NEXT
2660INPUT #H%,I%,K%,M%,N%,Q%,W%,Y%,Z%,R%,T%,B1%
2670CLOSE#H%
2680ENDPROC
2690DEFPROCpayment
2700FORP%=1TO24:IF C(P%)>0 THEN X%=X%+70+(5-N%)*10
2710NEXT
2720H%=X%+500*(5-N%)+Z%
2730CLS:PRINT''CHR$134;"WEEKLY PAYMENYS : -"''TAB(5);
CHR$131;"Wage Bill    = '";X%''TAB(5);CHR$131;"Ground R
ent = '";500*(5-N%)''TAB(5);CHR$131;"Loan Repayments
= '";Z%''CHR$133;"Total Payments this week = '";H%
2740PRINT''TAB(6);CHR$130;"Gate Receipts = ";A2%''CHR
$134;"Weekly Balance ( excluding selling"'CHR$134;"and
 buying of players ) = '";A2%-H%:W%=W%+A2%-H%
2750IF W%<0 THEN PRINT ''CHR$133;"Loan increased to p
ay bills."
2760IF W%<0 THEN W%=W%+1000:Y%=Y%+1200:Z%=Y%/20:GOTO2
760
2770Y%=Y%-Z%:IF Y%=0 THEN Z%=0
2780PRINT'CHR$131;"You have '";W%" , and owe '";Y%:*F
X15
2790A$=GET$:ENDPROC
2800DEFPROCscores
2810IF I%=0 PROCnomatch:ENDPROC
2820CLS:PRINT'CHR$131;TAB(6);"SCORES SO FAR THIS SEAS
ON"'CHR$130;" Press";CHR$133;"SHIFT";CHR$130;"if scree
n stops scrolling"
2830VDU28,0,24,39,4,14
2840FOR H%=1 TO I%
2850P%=INSTR(C$(H%),",")
2860A$=A$(VAL(MID$(C$(H%),1,P%-1)))
2870X%=VAL(MID$(C$(H%),P%+1,1))
2880PRINTTAB(21*((H%-1) MOD 2));CHR$(133);A$;TAB(11+(
20*((H%-1) MOD 2)));CHR$(134);
2890IF X%=1 PRINT "home"; ELSE PRINT"away";
2900A$=RIGHT$(C$(H%),2)
2910PRINTCHR$(134);MID$(A$,1,1);"-";MID$(A$,2,1);
2920NEXT
2930VDU15,26
2940*FX15
2950A$=GET$
2960ENDPROC
2970DEFPROCgoal:PROCsheet:FORP%=1TO8:FORX%=1TO2:PRINT
TAB(13,14+X%);:VDU141,131,157,132:PRINTTAB(0);"GOAL!
";CHR$156:NEXT:TIME=0:REPEATUNTILTIME=10:FORB%=1TO2:PR
INTTAB(13,14+B%);:VDU141,132,157,131:PRINTTAB(0);"GOAL
!  ";CHR$156:NEXT
2980TIME=0:REPEATUNTILTIME=10:NEXT:REPEATUNTILTIME=50
:PRINTTAB(0,14);SPC(1400):PROCwait:ENDPROC
2990DEFPROCwait:TIME=0:REPEATUNTILTIME>300+RND(300):E
NDPROC
3000DEFPROCnomatch
3010CLS:PRINT TAB(3,3);CHR$130;"There have been no ma
tches"''CHR$130;" played so far this season.":*FX15
3020A$=GET$:ENDPROC
3030DEFPROCstatus
3035IF B1%=1 THEN P%=20 ELSE P%=R%/(B1%-1)
3040CLS:PRINT'CHR$134;"Team picked : - ";A$(Q%)''CHR$
130;"Managerial status (max 100) = ";P%''CHR$131;"Seas
ons played = ";B1%'''CHR$133;"Morale = ";K%'CHR$133;"P
osition ";V(1);" in division ";N%''CHR$130;"You own '"
;W%;" and owe '";Z%
3060*FX15
3070A$=GET$:ENDPROC
>
```

How advanced is the 16-bit Advance 86A? Kathleen Peel finds out.





The Advance 86A is an IBM-compatible computer with a 16-bit 8086 processor 128K RAM, 64K ROM and colour, and costs £400. The computer is upgradable to the Advance 86B for another £900, which is compatible with the disc version of the IBM PC. There is also built-in provision on the main PCB for a further 128K RAM, £144, and the 8087 Arithmetic Processor.

The processor board is housed in a large dark-grey box — 530cm×420cm×11cm — which contains a deep recess behind a smoked glass Perspex cover in which the keyboard is stored when not in use, giving the unit a very modern hi-fi look.

At the rear of the processor are the interface and power connectors — the front panel houses the keyboard connector and an on/off switch.

The model supplied for review was a pre-production version assembled by Ferranti. The PCB had one very minor change on it, and the quality of construction looked very good.

The top of the processor box became warm above the power supply, but not excessively so. A monitor can be placed on top of the processor and reduce the very large amount of desk area taken up by the system. I would have preferred the processor on its side in a stand on the floor like the DEC Professional rather than lose this amount of space.

The separate keyboard is plugged into the box via a five-way DIN plug on the end of a coiled lead. It has two fold-away legs at the rear which enable it to be placed at a more convenient angle for typing.

The feel of the keyboard is good and the layout is the IBM standard with a separate, slightly-spaced numeric/edit keypad. The 10 function keys on the left-hand side of the keyboard are user-definable and can be switched to show their current application on the bottom line of the display.

The processor board contains no fewer than nine Ferranti ULAs as well as the 8086 main processor and its support devices — 8253, 8255 and 8259. Sockets provide for the addition of the extra RAM and the Arithmetic Processor.

The Advance has a full range of display connections — TV, video and RGB. The cassette interface is via a five-pin DIN socket with pins 4 and 5 taking the signal In and Out respectively. The Centronics printer interface uses a 25-way D-Shell connector, for which I had to disable pin 15 before getting print output. Once this was done there were no further troubles. This problem is symptomatic of the vast range of standard connectors.

The 80-column display was very clear and even the lower-case characters can be easily read. The display overscanned slightly on both edges, so it would be wise to check this point if you intend to purchase a monitor to provide the display.

A connection is provided for joysticks, 15-way D-shell, and a very useful mains extension socket for a peripheral device — say, a printer or monitor.

At switch-on, the computer performs a diagnostic check to see if everything is working, and faults are signalled either through the loudspeaker as a series of tones or on the screen in the form of error messages.

There is 62.57K free for Basic programs, but this may be increased for machine code to make better use of the 128K RAM.

Program debugging is very easy thanks to the full-screen editor and keypad, and the fact that you can list the faulty line quickly for correction. It is a shame therefore that the program data is space-sensitive because this is usually a major source of difficulty.

Editing is achieved by moving the cursor to the position in a listed program where the correction is to be made, and either typing over the old text or inserting and deleting by use of the keypad arrow keys. Pressing the Enter key puts the newly corrected line into the program.

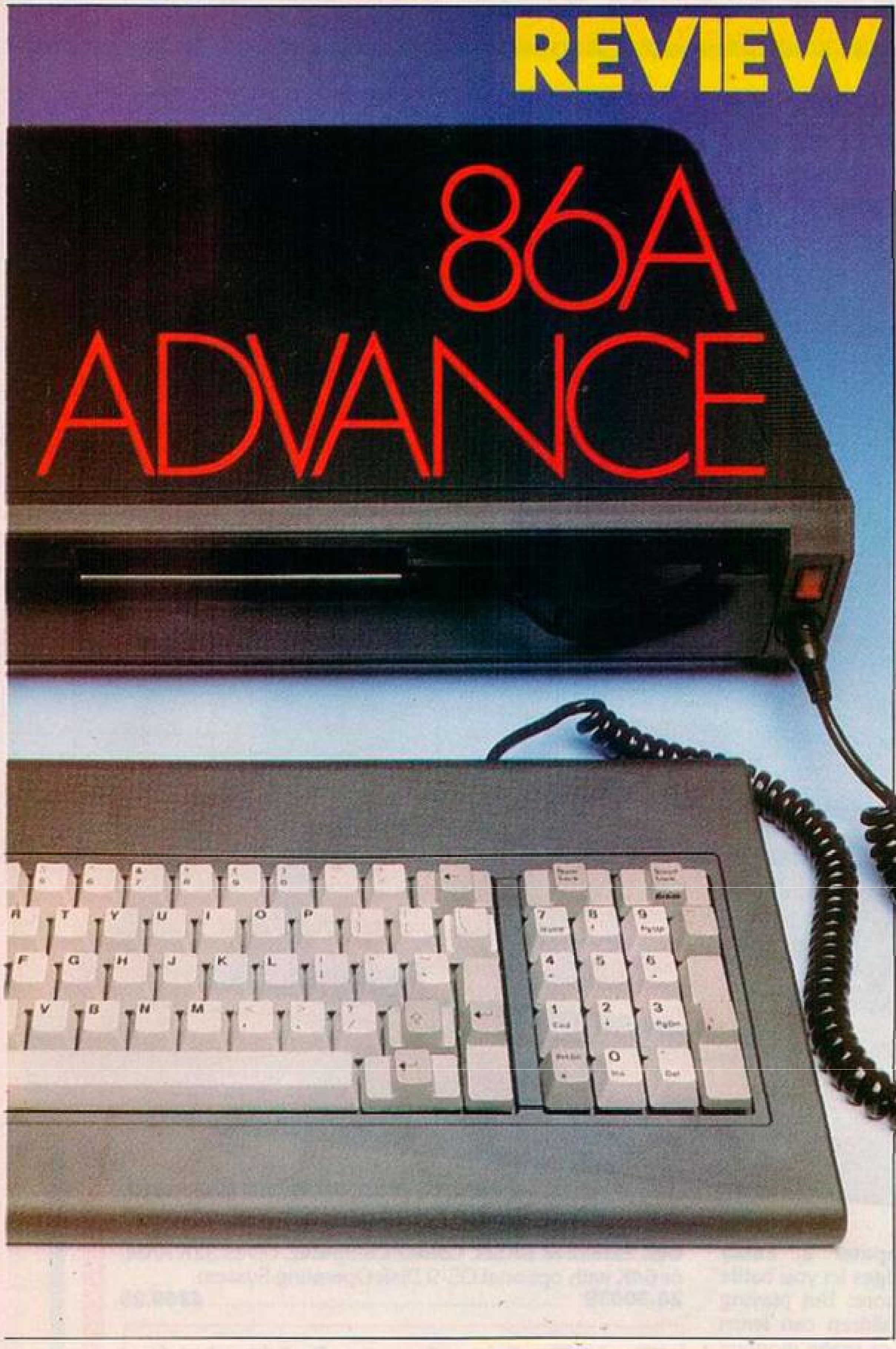
The editor can also be used to re-enter a direct command by placing the cursor over some portion of the command and pressing enter again.

Figure 1.

TEXT COLOUR	f, 0-31	b, 0-7	bdr 0-15	0 black	8 grey
				1 blue	9 light-blue
				2 green	10 light-green
flashing 16-31				3 cyan	11 light-cyan
				4 red	12 light-red
				5 magenta	13 light-megenta
				6 brown	14 light-brown
				7 white	15 bright-white

Figure 2. Medium Resolution

Palette 0	Palette 1	
0 background	background —	any of 16 colours
1 green	cyan	
2 red	magenta	
3 brown	white	



IBM. Four data types are supported:

Single-precision	!	Up to seven digits
Double-precision	#	Up to 16 digits
Integer	%	−32768 to 32767
Strings	$	Up to 255 characters long

There are four modes of screen display stored in the 16K video RAM:

40 × 25 text eight screens, 16 colours
80 × 25 text four screens, 16 colours
320 × 200 four colours two palettes, medium resolution
640 × 200 black and white, high resolution

In text mode 16 colours are available, 0-15, flashing 16-31 for the printed character, f, and eight colours for the background, b, with 15 colours for the screen border 0-15, bdr. This is specified by the command

COLOR f,b,bdr

— see figure 1.

Medium resolution gives the choice of two palettes of four colours — figure 2. A palette change instantly changes the screen colours and can be used to create special effects. The graphics commands are limited to PSet, PreSet and Line, although Line can box and fill.

In text mode the user can write to any of the eight/four screens and display another.

SCREEN mode, b/w or col, active scrn, visual scrn

The Advance also has the ability to produce a screen copy using the PrtSc command. Obviously the graphics can only be reproduced on the correct type of printer.

Sound may be generated by either Beep, usually called bell, Chr$(7) or Sound frequency time.

A program will continue to execute while the sound is playing unless another sound command is met. Then it will wait until the first sound command terminates before continuing.

The documentation provided was not the final version. In general the text was fine but the figures were omitted. There will be an obvious need for a beginners' guide, but they already exist in the guise of IBM PC introductions. I liked the idea of the single reference document — it was not too large and was easily read — even if half referred to the Advance 86B. One minor moan — I like an index at the back; the index preceded user notes on the software supplied with the Advance 86B.

The cassette interface is via a five-pin DIN socket which can also be used to switch the cassette motor on and off. File names are of up to eight characters but can be extended by adding a full stop and then up to three characters.

The Basic was quick: the simple speed tests that I normally run took only four and 93 seconds respectively. Benchmark tests show the Advance to be much quicker than the IBM PC.

PC Basic is now widely accepted as the standard. It has a wide range of commands with reasonable structure. In general, PC Basic is not wildly exciting, but it reached the top of the heap by being born with the name

CONCLUSIONS

- The Advance 86A is aimed at the expanding IBM PC compatible market and costs just £400. This can be upgraded to a twin disc-based system for an additional £900 giving MS-Dos compatibility.
- The Advance 86A is equivalent to the basic American IBM PC with colour board, and as such represents a considerable saving in money. Being IBM-compatible means there is a vast range of very high-quality professional business software available for the upgraded MS-Dos version.
- The lack of sophisticated graphics and sound facilities prevent the Advance from becoming a first-class games machine, but then it was always intended for more serious uses.
- The Advance 86A represents good value today. It remains to be seen whether the coming Japanese IBM look-alikes are competitive and offer a challenge in the next few months.
- My only criticism — which applies equally to the IBM PC — is that it takes up a huge amount of desk space. ■

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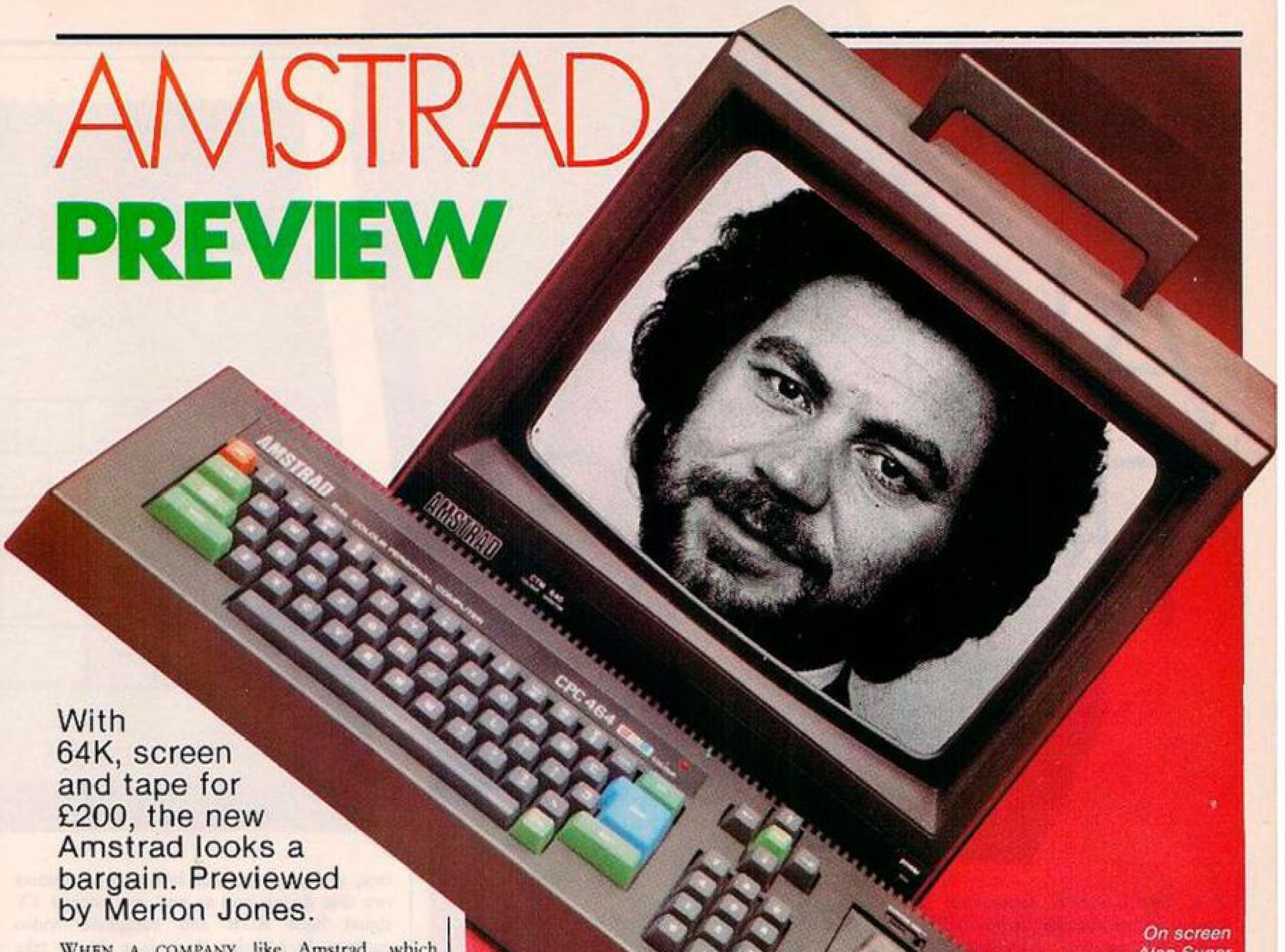
Who Is The Colour Computer For? It's ideal for anybody who wants to enjoy video games in a system that can be used for many other household, business and educational tasks. It's great for beginners who want a computer that's easy to learn on - but not limiting - and it's perfect for hobbyists who want a full-features system with the opportunity for advanced graphics and programming expansion.

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AMSTRAD PREVIEW



On screen Alan Sugar Amstrad's founder.

With 64K, screen and tape for £200, the new Amstrad looks a bargain. Previewed by Merion Jones.

WHEN A COMPANY like Amstrad, which smashed open the hi-fi market with low-price audio equipment, starts making micros the Sinclairs, Acorns and Commodores had better watch out.

On paper the CPC-464 looks like it is going to give the Electron and the Commodore-64 a very hard time, not to mention the Oric, Atari and even the Spectrum. It has as much memory as any of them — nominally 64K, in practice 42K free. The Amstrad has a numeric keypad as well as a real typewriter keyboard, and in high resolution mode has 80 character display and 640 × 200 resolution.

What's more Amstrad is promising that the CPC-464 will be in the shops by June. On these grounds alone the Amstrad would be a strong contender but for £200 it includes a built-in tape recorder and a monochrome green screen monitor in the price. For £100 more you can have a colour monitor.

The power supply unit is in the monitor because Amstrad see the CPC-464 being used as a system. A word processor will be one of the first programs released for the machine and a disc drive with CP/M is planned for release later in the year.

The built-in tape recorder, which was a popular idea in our "Design a Micro" competition, has alternative 1K and 2K baud rates for loading and saving programs. The Amstrad also has a Centronics compatible printer port and a joystick socket. There are RGB and stereo sound outputs, although it also has a small internal speaker.

CPC 464

The CPC-464 is Z-80A based with the standard three-voice AY-3-8912 sound chip. An Uncommitted Logic Array handles graphics which offers you three modes. In low resolution, 160 × 200, you can use 16 colours on screen out of a palette of 27. Top mode is any two colours from the palette in 640 × 200, 80 character resolution. Default mode is 320 × 200, 40 character resolution in four colours.

32K of ROM includes a fast Basic including two new commands — After and Every. Crude windowing allows you to put up to seven text windows and a graphics window on screen. The keyboard is colour coded — red for escape, blue for enter and so on and 32 of the 74 keys can be redefined as function keys.

Amstrad is taking home computers very seriously and has also set up a software house, Amsoft, which hopes to have 50 programs ready for the launch of the CPC-464 including games and more educational offerings like Happy Numbers. Since Alan Sugar set the company up in 1968 Amstrad has taken a third of the hi-fi market and its sales this year will be in the region of £100 million.

Amstrad plans to sell hundreds of thousands of its CPC-464s by Christmas — way up in the Sinclair and Commodore league. The company has spent 16 months developing the project and is already working on a new range of microcomputers to take up where the CPC-464 leaves off.

At first glance the CPC-464 looks like a winner but can a company with no experience of making computers come straight into the micro market?

Appearances can be deceptive so we will be putting the Amstrad to the *Your Computer* test. Read what our reviewer thinks of the CPC-464 compared to its rivals in these pages next month.

REVIEW

ALPHA-TRONIC



FOR THE LATEST generation of home computer owners the initials CP/M are not especially resonant. Although CP/M is a household name in the world of business micros it rarely appears in the pages of *Your Computer*. One reason for this is that most home computers do not require disc drives.

CP/M is simply the disc operating system which the microcomputing world has come nearest to accepting as standard. Because it has been running on 8080 and Z-80 based micros since 1975, a vast range of software has been developed for it. Well over 2,000 programs are available on CP/M and there probably are as many different hardware configurations which run them.

Once you have got a micro which takes CP/M you can enjoy a choice of packages which range from software classics such as word processors like Wordstar and spreadsheet programs like SuperCalc to language compilers, adventure games and a host of business applications.

You can now buy a CP/M based system for less than £700 — in the form of Volkswagen subsidiary Triumph Adler's Alphatronic PC. This is a 64K computer built around a 4 MHz Z-80A processor. The interest in reviewing this machine in these pages is that it is also claimed to be a dual-purpose computer, one that can provide equally well for games and business applications.

As a stand-alone cassette-based system the PC costs £347. To run CP/M you will need to buy the disc drive for £330 and a CP/M disc for £29, with a second drive costing £270. These are 40-track double-sided, double-density drives which give 320K storage per 5¼ inch disc.



Triumph Adler's fully-fledged business machines are built like tanks and some of the same principles of construction appear to have been employed in the design of the PC. It is an extremely sturdy machine which makes most home computers look distinctly flimsy.

As you might expect from a typewriter manufacturer the keyboard is excellent. In all it boasts 86 electric typewriter style keys which include a separate numeric keypad and six programmable function keys.

At power-on the function keys are already assigned commands which are displayed in a panel at the bottom of the screen. These can be reprogrammed with up to 15 characters. Pressing the shift key gives you a further six commands.

At the back and the side of the computer are all the I/O ports and interfaces you are likely to need: a cassette port which loads and saves at 1,200 baud, an RS-232 serial interface together with a Centronics type parallel interface, an expansion bus interface to connect two disc drives, and as well as a normal TV signal both RGB and composite video outputs. In addition there is a slot to take ROM cartridges.

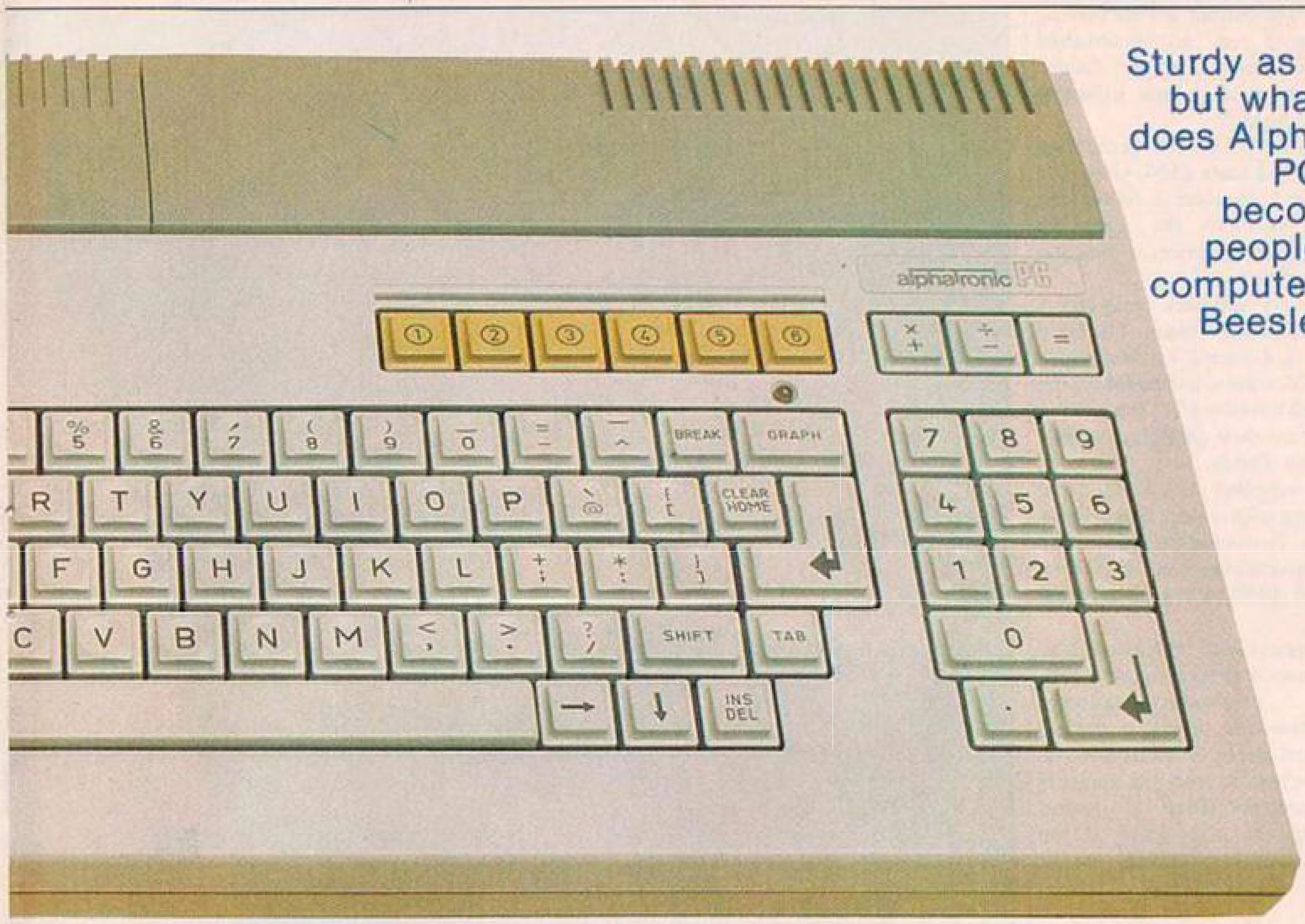
All these features make the PC good value as a low-cost business machine. On top of the range of CP/M software Triumph Adler is converting a number of programs written for its larger machines — accounting packages and suchlike. Many of these run on the company's own disc operating system which is supplied with the drives.

A further point in favour of the PC's business capability is that Triumph Adler is adapting its local area network, the Micromite File Server, for the PC, making it possible to link up to 254 machines together.

In its role as a home computer, however, the PC is not quite so impressive. By today's standards the graphics are poor. There are two text display formats, 40 by 24 and 80 by 24. Corresponding to these are two graphics modes which give pixel resolutions of 80 by 72 and 160 by 72. Eight colours are available in the lower text and graphics resolution but switching to the 80-column screen translates these into shades of grey.

In respect of its graphics facility the PC is very similar to the Sharp MZ-700. Like the MZ-700 it also offers a set of predefined graphics characters which can be accessed by pressing the Graph key. But there is no provision for user-defined characters.

This means that there is little scope on the PC for writing interesting games. Certainly you could not achieve the spectacular graphic effects found in games on much cheaper



Sturdy as a Beetle, but what chance does Alphatronic's PC have of becoming the people's home computer? Simon Beesley moves into top gear to find out.

machines. Sound is equally limited and consists of a single beep, emitted from a piezo-electronic buzzer. Triumph Adler says that it will be commissioning games from leading software houses but it is doubtful that many will find the PC promising material. Consider how little software support the Lynx and the Memotech — machines with far greater games potential — have received to date.

Unusually for a micro at this price the PC not only has a full 64K of RAM but also a further 28K of ROM containing the Basic interpreter and monitor. If a disc drive is attached with CP/M on disc the monitor reads in CP/M leaving about 49K RAM spare. Otherwise it transfers the Basic interpreter to RAM.

The Basic interpreter is standard issue Microsoft Basic and consumes a sizeable 24K RAM. Once the monitor and video RAM have taken their share the user is left with around 28K. Microsoft Basic could be called the grandfather of all micro Basics. There is a version of it on the Dragon and most home computer Basics share some of its features.

For a manufacturer it has the advantage of being instantly available. No need to spend months developing your own Basic and then more time ironing out bugs, when you can buy Microsoft Basic virtually off the shelf. Its disadvantage is that it is beginning to show its age.

When your consider that in 16K BBC Basic offers more features, includes an assembler, and is substantially faster, you begin to wonder how efficient Microsoft's code is.

Still, in comparison with, say, Spectrum Basic the Triumph Adler version is quite a powerful one. It includes a number of programming aids such as Trace, Delete, Auto and Renumber; error-trapping is catered for by ERR, ERL which respectively report the error code number and error line, while Resume and On Error Goto enable a program to carry on after an error; and If Then Else and While Wend make a gesture towards providing a structured programming facility.

Several other of its features will be new to most home computer owners. As well as defining a function, you can use Def to declare that variables beginning with specified letters will be of a particular type — either integer, single or double precision, or string. With Swap you can exchange the values of two variables, while VARPTR returns the address at which a variable is stored.

On the graphics front the range of commands is limited, in keeping with the machine's low resolution. Pset and Preset switch on pixels in a specified colour — although all the six pixels in one character space must share the same colour. Line, as on the Dragon, is used to draw lines, rectangles and blocks, and Point tests whether a pixel has been set or not.

To format the text display Console and Width are available. Console lets you set the height — but not the width — of a screen window. Width gives either a 40 or 80-column display. In the 80 column format text is not easy to read on a standard television so most owners will need to buy a monitor; particularly since this is the format used by CP/M software.

Triumph Adler has supplemented Microsoft's line editor with a full screen editor similar to that found on Commodore's micros. This is a welcome addition. Full screen editors are always preferable: correcting a program line on the Dragon with the Edit command is a cumbersome business; compare the ease and speed with which the CBM-64 lets you move directly to the line at fault using the cursor keys.

All in all the PC's Basic could be described as dull but worthy. And this judgment could be extended to the machine as a whole. Triumph Adler has produced a well-engineered machine largely lacking in any innovative features.

If you are looking for a genuine work and play computer you would do better to consider Memotech's MTX-512 or Camputer's 128K Laureate. Both of these run CP/M as well as offering sound and high-res graphics. Both however cost more. ■

CONCLUSIONS

- The Alphatronic PC's chief merit is as a cheap CP/M based system. Given the large range of CP/M software available it would be suitable for the home computer owner who wants to graduate to more serious applications.
- Its other virtues are sturdiness and reliability. It boasts one of the best keyboards on any computer under £1,000.
- Lack of high resolution graphics and sound renders it unexciting from the point of view of the owner who is interested in games and other leisure pursuits.

TANDY C

Real keys, a white case and the special OS9 operating system — Kathleen Peel sees how the new Tandy shapes up.



TANDY has joined the current fad for putting a proper keyboard on an established computer. In this case it is the Colour Computer 2 which sports a new off-white livery and 64K of memory.

The CoCo 2 is about 15 percent faster than the original CoCo and costs £160. Considering that the CoCo 2 provides a colour and pixel resolution virtually the same as computers costing half the price, it does not appear to be competitive.

What makes a very ordinary computer a little bit special is the new software. The OS-9 operating system is designed by Microware System Corp. for Motorola, and based on the Bell Telephone Laboratories UNIX operating system, to be used on their 6809E processor. This costs £70 from Tandy.

The software is supplied on a 5.25in. disc and comes complete with a very comprehensive set of manuals. To use the OS-9 operating system requires a minimum of one disc drive, this adds a further £350 to the already not insubstantial cost.

The operating system may be enhanced by the addition of Basic-09 costing another £70, and requiring a minimum hardware configuration of two disc drives, a further £250 for the second drive. Fortunately, the user can start at the bottom with just the basic computer and progress from a modest beginning to a system with many of the features more usually found on a minicomputer.

A restyled version

The CoCo 2 is a restyled version of the old Tandy Colour Computer that has been around for a long time now, with 64K of memory. What is interesting is the software for the computer. OS-9 removes the existing minimal operating system and Basic language and substitutes a full operating system. The new operating system has limitations placed on it by the inadequacies of the hardware.

The operating system has hierarchical directories and files, multi-user, multi-tasking capability and device independent input output. The hierarchical directory structure permits the user to group files in logical blocks and sub blocks.

This is organised like a family tree, starting with you and finishing with your ancestors'-directories', each directory containing files on each of the people concerned. Access to every file is governed by properties called ownership and attributes. These are Read, Write and Execute for owner, the person who created the file/directory, and public, everyone else.

The other two attributes are Directory/File: on for directory, off for file. Shareable, governs whether more than one person can access the file at the same time.

Multi-user infers that more than one person can access the system simultaneously. Unfortunately the hardware limitations of the CoCo 2 limit usage two users or one user and one printer. Multi-tasking entails that more than one task may be active at the same time, tasks may be sent to sleep and activated after a predetermined time.

The timesharing is achieved by using a facility called timeslicing. The proportion of time given to each process being set by the priority allocated to each process. Each process can have one of the three states:

Active; a process using CPU time;

Waiting, a process waiting for termination of an existing process; and

Sleeping, a process suspended for a specified time interval. Usual state of processes waiting for input or output.

Device independent I/O refers to the ability of the operating system to transfer data in a neutral manner not specific to any device. To move data, a path of logical devices is given, such as P for printer, D0 for disc drive 0 and so on. Where possible default devices are assigned, the screen for List and disc drive D0 for Save, but these can be overridden by specifying an alternate path.

Besides the operating system there is a high level language which acts as a command interpreter shell. The shell is automatically entered on startup and has commands like ASM, Exbin/Binex, and Login. ASM is assembly language programming which has a number of limitations. The code must be written in position independent code as the system determines where the code will be at Runtime.

The code must not be self-modifying and must use the standard OS-9 memory module format. All I/O should use OS-9 system calls. Binex converts a binary file into an S-Record file, Exbin does the reverse. An S-record file is a type of text tile that contains records representing binary data in hex format. This format is often directly acceptable by commercial programmers and emulators that are RS-232 interfaced.

Three attempts are allowed

Login provides for system security and asks for a user name and password, three attempts are allowed before the process is aborted. An acceptable entry is assigned predetermined file and directory access.

The username and password may be of upto 32 characters including spaces and each user may be given an individual user number of 0



to 65535. The number is allocated to superuser and is used to identify all processes started by the user. Each user has a priority and an initial pathlist for execution and data directory. There is even a message file which will be displayed on successful login. There are a tremendous number of facilities available.

Basic09 is the first language to be produced that will run under the OS-9 operating system. It is an interactive compiler that produces very fast and very short, packed, memory-saving code. It is not really Basic but a very much enhanced, highly structured language, not requiring line numbers, with many of the features of Pascal and Basic incorporated.

The programming system as Tandy call it consists of:
text editor,
multi-pass compiler,
runtime interpreter,
high level interactive debugger and
system executive.

Basic09 also contains a Graphics Interface — GFX providing access to the CoCo graphics functions and a Runtime package — RUNB that is a condensed version of Basic09. It occupies half the space, but has no file editing or debugging facilities and only executes packed modules. It is difficult to know what one would do with Basic09. Programs written in Basic09 require compatible systems to run, OS-9 discs are not readable by the normal Tandy DOS. I also do not know of a similar implementation of Basic, so learning this does not appear to have any long term viability. That said, it is certainly one of the most powerful Basics I have seen on a micro. ■

CONCLUSIONS

■ Unfortunately the hardware hardly does the software justice, the limitation on the number of users suggests that the CoCo is really the lowest level at which such an operating system can be implemented.

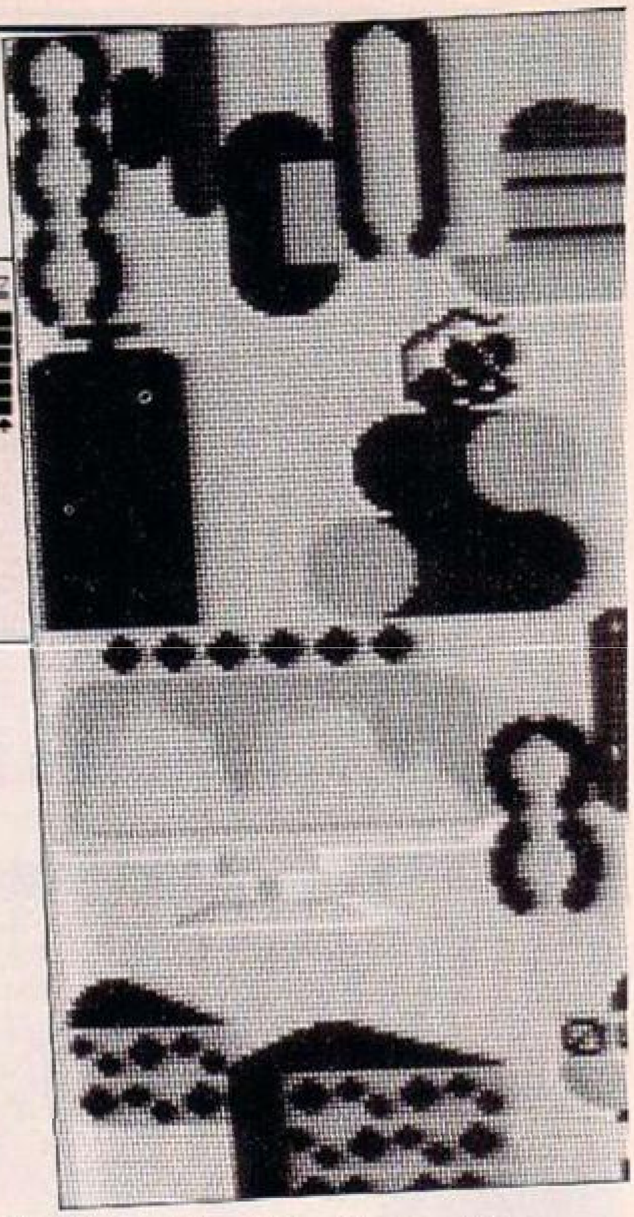
■ I doubt very much whether there is any real potential use as a business system because of the 64K limitation in memory, lack of 80 character width option and no monitor facilities.

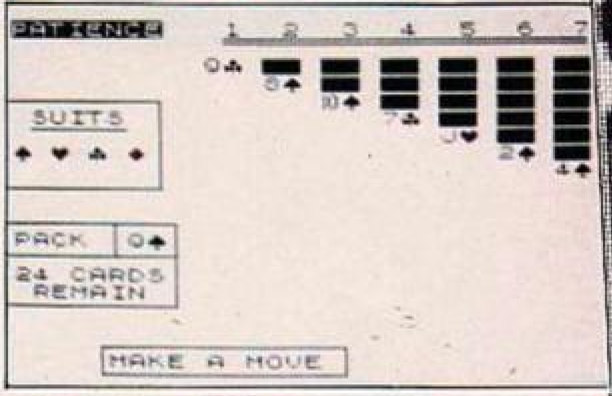
■ There is no doubt that for someone who loves his CoCo this represents a natural extension which will be very well received. This is not simple old Basic but a real operating system which is not only very comprehensive, but very complex and not at all suitable for the occasional user.

■ It will be of use to those who want hands on experience of a Unix — type operating system and wish to learn on a computer setup that enables the experience to be gained in easy stages, but that does require a similer set ot instructions.

SPECTRUM

Mike McCann negotiates an obstacle course, collects glasses, shoots the inevitable aliens, catches mice and gets involved in high finance. Enough to make you take to the bottle — and he does that too!





SINCLAIR'S ZX SPECTRUM is the most common home computer in Britain, with well over a million in use today. In spite of its shortcomings — keyboard and interfaces, to name just two — its vast numbers give it a tremendous advantage over its competitors. The software companies obviously want to sell as many of their programs as possible, so they write them for the best-selling machine. The result is that there is more, better and cheaper, £5-7, software for the Spectrum than for any other home computer.

Having said that, however, Spectrum users will be well aware that there are plenty of run-of-the-mill games programs around as well. Perhaps because the Spectrum has been with us for so long and so many programs have been written for it, it is increasingly difficult to come up with a good games idea. Many games are depressingly familiar — there must be at least 57 varieties of Space Invaders and Pac-Man.

There is far too much software in which the main challenge to the user is to co-ordinate finger movement over the keyboard with the movement of the assorted nasties on screen. The action may be fast or slow, the sound fantastic or non-existent, and the graphics may be hi-res or dire, but running the programs is a mechanistic process. Once you have mastered them you hardly have to think what you're doing, especially if you have a joystick.

One way to overcome this drawback is to market your programs not merely as a game, but as a comedy show, with optional song. Automota are past masters at this, remember Groucho, *Your Computer* December 1983?, and the latest in their Pi-Man series is called Pi-Eyed. It uses an idea that has been around for almost as long as the human race: alcohol and its well-documented side effects. You play the Pi-Man in his most bucolic form, cleverly avoiding the traffic by going into pubs. Once you're in the pub, the doors are locked and you are told that you can't leave until you have finished every pint on the bar.

As the Pi-Man's beer consumption increases, he gets more difficult to control, and he staggers around the room, bouncing off his fellow drinkers, slipping on crisp packets and losing you ten points per bounce. He also has the endearing habit of facing the wrong way and you have to plan around with the controls as he reels and lurches about.

In between dodging cars and downing beers, the Pi-Man causes havoc by going into some other shops on the high street, as well as the Police Station and Automata's Headquarters. His beery presence draws forth a joke, even mine are better than theirs, and our hero is sent on his way — to another pub, of course. One of the friendlier features of this game is that, like a real pub crawl, it lasts quite a long time.

A novice can keep the Pi-Man alive for five minutes, which is a welcome change from the killed-three-times-in-five-seconds space invaders.

An essential part of Automata's package is the "free hit record" on the flip-side of the program tape. Naturally enough, the Pi-Eyed song is about drinking to excess, and it won't be a hit.

The Pi-Man is a durable character, too. He crops up again, though not looking at all like his former self, in Pi-Balled, which is also from Automata. As the sleeve says: "Free Musical Mess by Clair Sinclive", but this time the song is better than the program. You have to hop around a 28 block pyramid, avoiding the Pi-Man and his five accomplices who, is familiar style, try to kill you. Apart from the song, the only link with Pi-Eyed is the scoreboard, which is displayed above a picture of a bar.

Possibly the best of last year's Spectrum programs was Manic Miner, written by Matthew Smith of Software Projects. Jet Set Willy comes from the same team, and is written around the sort of story everybody had heard and nobody can believe. William is extremely rich and extremely brash. He lives in an enormous mansion and has just thrown an enormous party. Now he's got to clear up an enormous mess before his housekeeper will allow him to crash out. So off you go: left a bit, right a bit, jump and collect as many glasses as you can. As with a thousand other games there are hazards all over the place, most of them fatal.

Some of the rooms in Willy's pied-a-terre are a little bizarre, to say the least: in the Nightmare Room, for example, our hero turns into a flying pig, and has to avoid bats, broomsticks and a large right foot before collecting the glass. At least there are plenty of different rooms — you can be killed by the beastie of your choice.

Software Project's marketing ploy is not a free hit record (though the Spectrum does emit a beep version of "If I were a Rich Man to accompany Willy on his quest for glasses). Oh no; they've hit on the idea of running a competition. A case of Dom Perignon champagne (they don't say what vintage) and a helicopter trip over your home will be yours if you can find out how many glasses Willy has to collect before he can go to bed.





Software Projects uses a clever security system for this program, presumably to prevent anyone reading the competition answer from a listing, as well as to prevent illegal taping. You have to enter a code before the program will run.

Speaking of security, imagine stealing your way through the corridors and lifts of the Secret Police Headquarters and turning off the power supply of the main computer. Visions Software claim it's got nothing to do with 1984, the book or the year. They say it will all happen in 1994, which is the name of their new maze and obstacle course game. With seven different levels to negotiate, and all the usual paraphernalia of security to evade — robots, plasma bolts and the odd chainsaw, you might have your work cut out.

The advantage 1994 has over other similar games is in presentation: a menu lists a range of options, including a "panic button" which holds the action so you can take the dog for a walk without losing the game. There is also a practice mode — you can practice at level seven, even if you can't reach it in a proper game, and the instructions are displayed on the screen.

Orwin Software also score highly for presentation, putting larger companies to shame with their Centipoid Plus Three, which is a brightly coloured space invaders type game with six different screens. Patience is a quality which is sorely tried by computer games. It is also a card game which Haven Hardware has translated into a computer program, faithfully reproducing the original.

The computer shuffles the cards for you, but it is your skill and judgement that wins the game (yes, really!). Picking up the rules and mastering the controls takes a couple of minutes. Because it is a familiar game, Patience could well introduce more people to computers. It will be interesting to see if the real ace which Haven holds is a range of card games as good as this. At least there are no aliens in this one — even the knave of Hearts is harmless.

Competition time again, with Flix from Softricks. This is a brilliant but simple puzzle game in which you have to use your brain rather than your fingers. You are presented with a picture of a Vogue magazine cover, which is then divided into a grid. The size of the grid depends on the difficulty level which you set at the beginning, between one and four. Level one gives you a 4×3 format; level four is 32×24, and is the one the competition uses. The grid is then shuffled around the screen in the same way as the cheap and nasty plastic puzzles you used to win at fun fairs.

The object of the exercise is to get back to the original picture in as few moves as possible. Level four should take up most of your time between now and the end of October, when the competition closes.

You can save your solutions or part solutions on tape, and go back to them time an time again. And, if you get bored with the Vogue cover, you have a choice of two other startlingly realistic pictures — a fast car and a fast motorbike — to load up. All the graphics are drawn with paintbox graphics software. First prize is a colour monitor for the Spectrum.

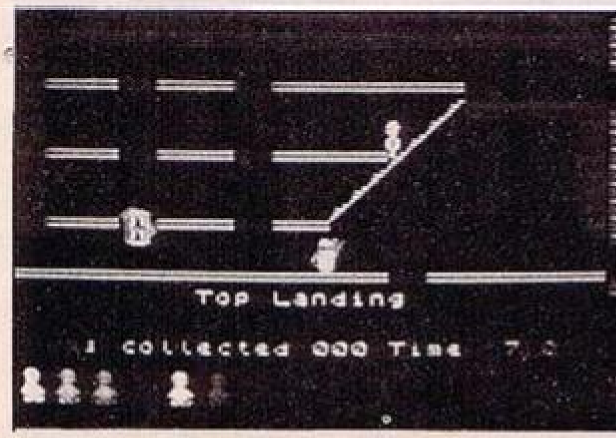
Accountancy and finance might not be your idea of games, but Cases Computer Simulations have come up with three programs: Stock Market, Oligopoly and Manage, which are good fun to play, though can be time-consuming. Each game is a model of the "financial world", and the object is to make as much money as possible, usually at the expense of someone else — see how life-like it is? You type in production levels, price, marketing tactics and so on, the computer can prompt you if you want, or you decide how many shares to buy and sell.

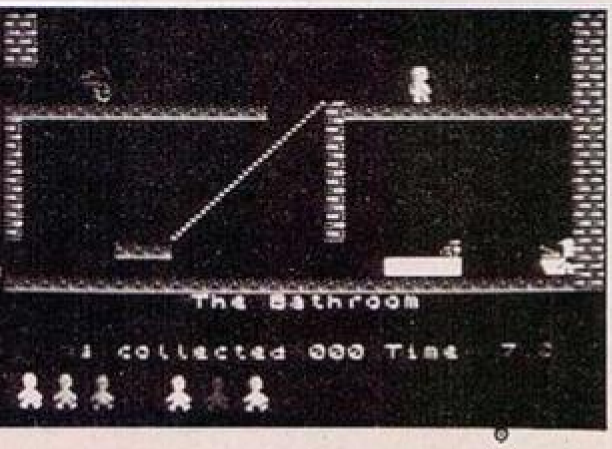
The results are then neatly displayed in tables and graphs on the screen or, in the case of Oligopoly and Manage, on a printer. CCS say that these two programs are suitable for teaching business studies or for real management training, so the printer option is useful. In Stock Market the computer give you an assessment of your performances, picking out mistakes and congratulating your strong points. This is in fact the most entertaining of the three.

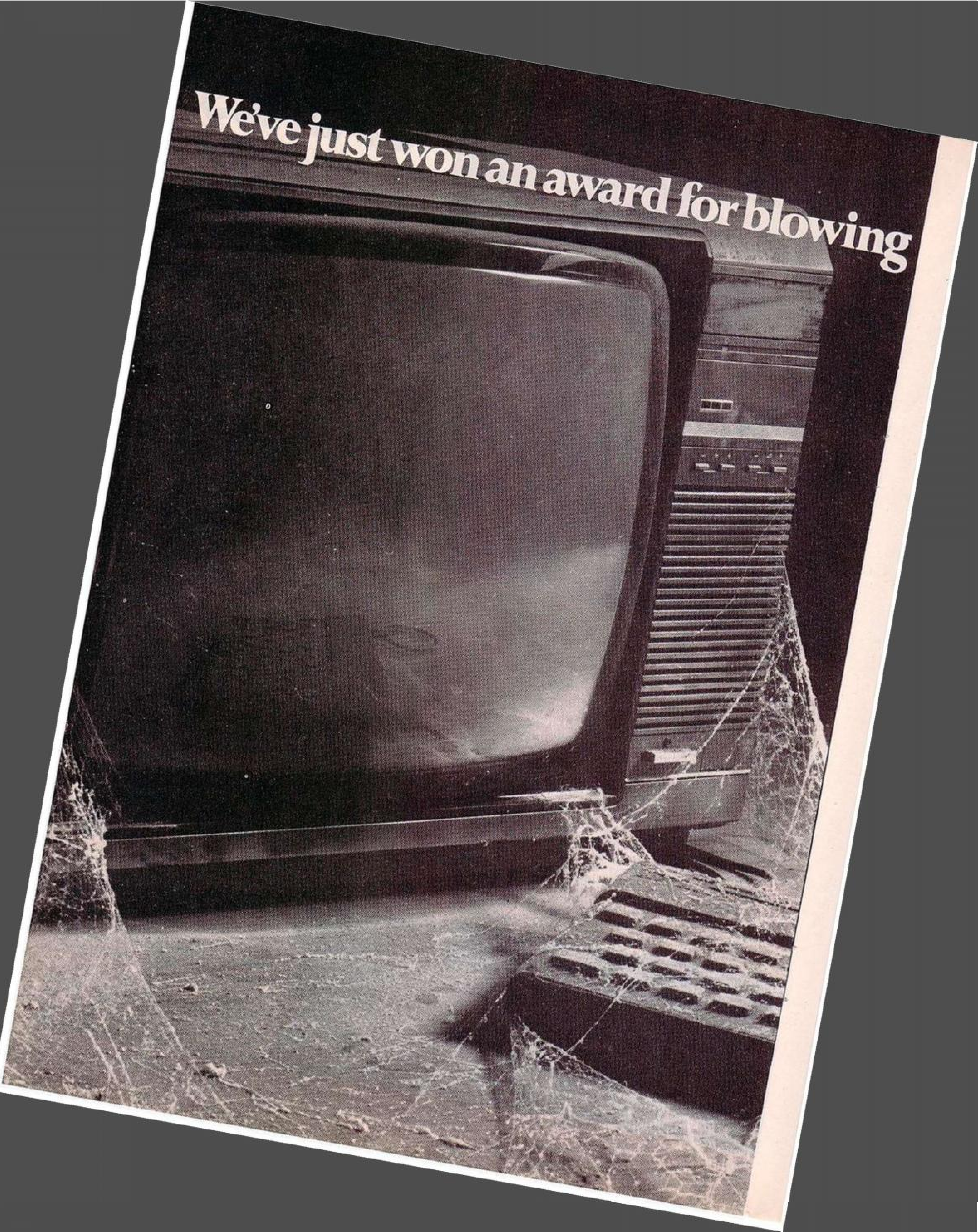
A basic knowledge of accounts is obviously more useful than a joystick for these programs, but even so, I managed to make an after tax profit of £1,950 in a week's trading on the Stock Exchange — by exchanging guns for butter.

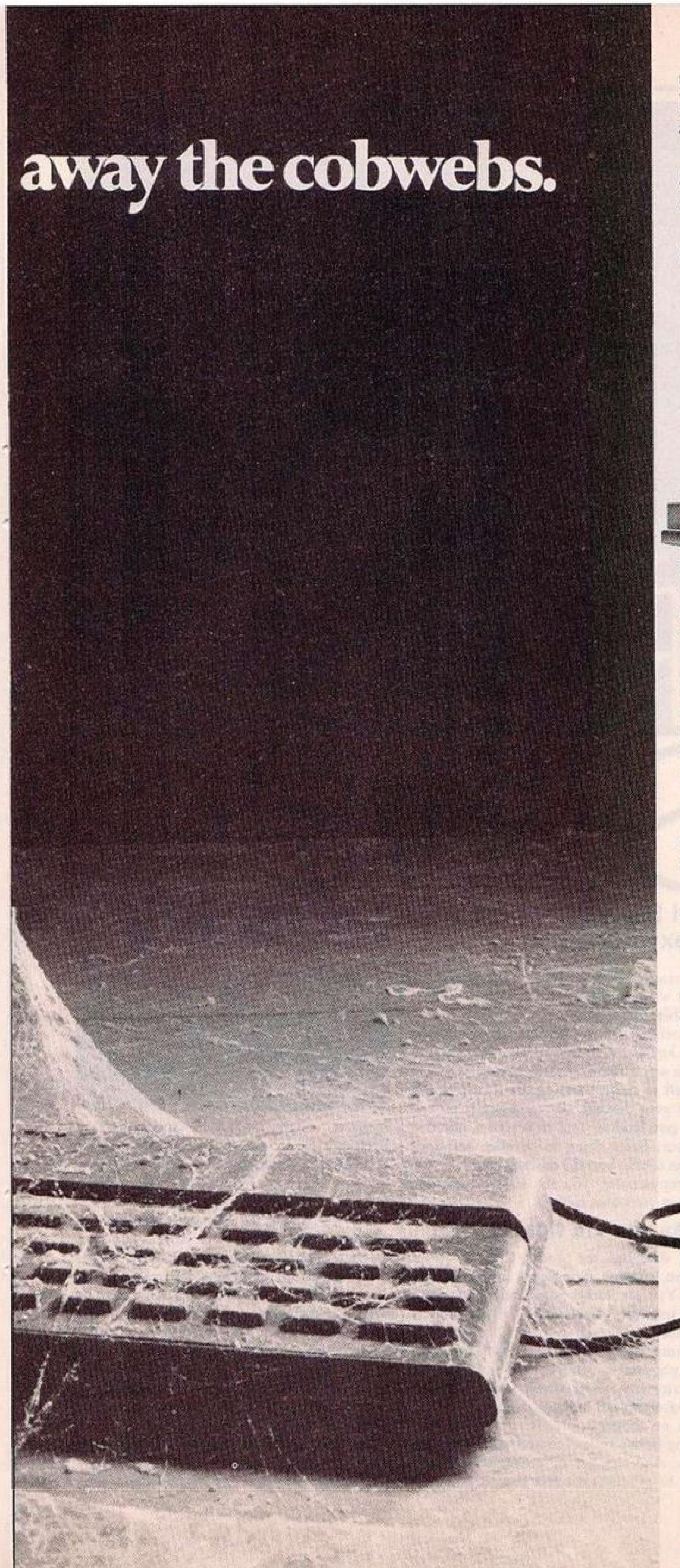
Finally, a computer game for the under fives. Caesar the Cat comes from Mirrorsoft, alias Mirror Group Newspapers, and has one of the most attractive displays of any game. The screen is more of a picture rather than plain old graphics, and the animation is almost up to Tom and Jerry standards: Caesar runs, turns and jumps in a pretty realistic way.

His aim in life, as with any other cat, is to catch the mice which continually raid the larder, and deposit them outside. He loses marks for banging his head, and loses one of his feline lives if he breaks a storage jar. ■






We've just won an award for blowing



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ACORN SOFT SURVEY

Paul Bond saves the galaxy yet again.

NOSTALGIA TIME at *Your Computer*. Here they come crawling down the screen, but by swift manipulation of the Z and X keys and a few stabs of the Return key we despatch a few more alien intruders to the great cathode ray tube in the sky.

Yes, there is a perverse pleasure is using a relatively highly-priced and sophisticted microcomputer to play Space Invaders derivatives. Of course, it is a sophisticated business and educational tool, but Space Invaders is the micro equivalent of the company cricket or squash team. If you don't cut any ice there, you can forget it, regardless of how good you may be on paper.

Purists and connoisseurs will always find fault. It has been said to me of Beebugsoft's Alien Destroyer — the "classic arcade game for the BBC Micro Model B" — that the aliens descend rather too quickly and are the wrong colour and wrong shape. But control of the laser base is extremely responsive, allowing the player to continue his defence effectively, while dodging the falling bombs.

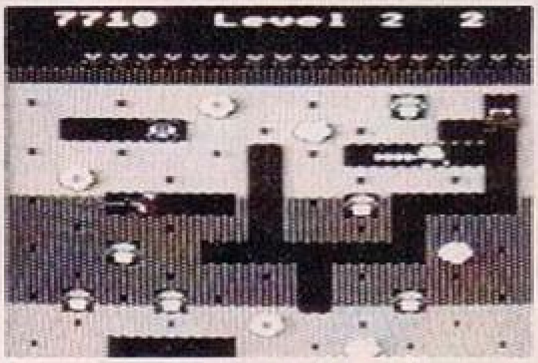
Enjoyable but somehow staid in comparison with Program Power's Position. This should be sub-titled Mondrian with Machine Gun, as the strange cubes and patterns come sliding down at your beleaguered earth-station. This emits a truly nerve-shredding phaser sound as you blast away, mowing down the advancing hordes like the Czar's soldiers do it to the masses in Battleship Potemkin. That's a film, not a game by the way.

Zarm, from the same company, moves us away from casual genocide to another old arcade fovourite, Lunar Lander. Sufficient exposure to these games leaves you with an inordinate amount of admiration for Neil Armstrong and Buzz Aldrin. You wonder how they managed to get as far as bashing the contact wires into the lunar surface, let alone remembering speeches.

On seeing a gap in the space rocks press the release key — the Shift button — and you are on your way into thne hurtling mass. Weaving from left to right, pressing the thrust button to slow your descent, you land gently on one of the give landing sites to rescue a stranded astronaut. Same thing in reverse, soft-dock with the orbiter and the quicker you do it, the more bonus points you get. Easy as crashing the car in your own garage.

Rocks and TIE fighters

Still dodging the rocks, Vortex from Software Invasion plunges us into unknown space. You are rather unscientifically being drawn into the black void — presumably a black hole is the real culprit. Of course the fascinating thing about black holes is that some physicists believe that a state of singularity may exist within them. Should your spacecraft fall into one, since the laws of physics no longer apply, it could turn into anything from a tube of toothpaste to a packet of Daz. And the list of possibilities is not limited to products connected with domestic hygiene. Sadly, all this speculation is irrelevant to the actual game which presents you with the usual onslaught of TIE fighters, followed by rocks, followed by TIE fighters, followed by rocks, zzzzzz.



Uh — what was that? Blast, crashed into an asteroid. Always keep your etheric radio on, or chew gum when flying this kind of long monotonous space mission. On earth, long-distance lorry drivers combat boredom by winding down their windows. This is a very silly thing to do in a spacecraft.

Well, what was supposed to be so good about Vortex was that it was apparently in 3D. So is 3D Space Ranger, from Microbyte. It makes up in colour what the previous game lacks, and the spaceship banks.

You have to locate and destroy the Death Star approaching the Federation sector — interesting confusion of Stars Trek and War,



NARE

this — and it is protected by kamikaze cohorts that keep crashing into you. Oh, and don't forget the asteroids. You zip through space resolving the moronic marauders into their component atoms.

A little delta-vee down to the planet's surface, vroom over a multicoloured plain being assailed by more of the same aliens, duck down into a trench and chuck a bomb down the proverbial maintenance shaft, fight your way back through the previous screens and knock off for a glass of Lucazade and an oxygen pill. All in a day's work, cap'n.

Zaxxonesque Defender

Pretty as it is, all this pales into insignificance, however beside Pace Software's excellent Fortress. This Zaxxonesque game is a kind of 3D Defender. You must pilot your starfighter through the enemy defences, bombing fuel dumps to boost your own energy supply and keep you airborne. Your craft casts a shadow on the ground, and you are presented with a three-quarter view of the action, rather than head-on as in the previous two programs.

The first obstacle you encounter is a brick wall which you can only fly over at maximum altitude by shooting through a slight dip in the centre of it. Once you've got the hang of this you have to dodge round missile silos, which inevitably spew out a rocket as you pass over them, at the same time as you avoid the remorselessly accurate fire from things which look like hostile liquorice allsorts. The game looks good. But here we must pause, and furrow our brows. Is it playable? I sent some of my best men into the breach here and they were doing well if they got as far as the stage where hostile aircraft start attacking. Surely it wouldn't hurt a game as good as this to have a couple of easy levels, if only to get people hooked when they play it in the shop?

Aerial traffic is the theme of Microdeal's Air Traffic Control Simulator. Ignore the silly picture of a Harrier crashing into the control tower on the cassette packaging. This is what we call negative marketing. Normally cassettes are designed to make the game look better than it is — this one is designed to make the game look worse than it is.

The aircraft in question are not Harriers but RPVs — remotely piloted vehicles.

You have control of five aircraft, scoring points for each successful landing. The screen display is in black and white. The centre section shows — initially — a radar picture of your control area with the runway across the centre and the runway outer markers shown as dotted lines.

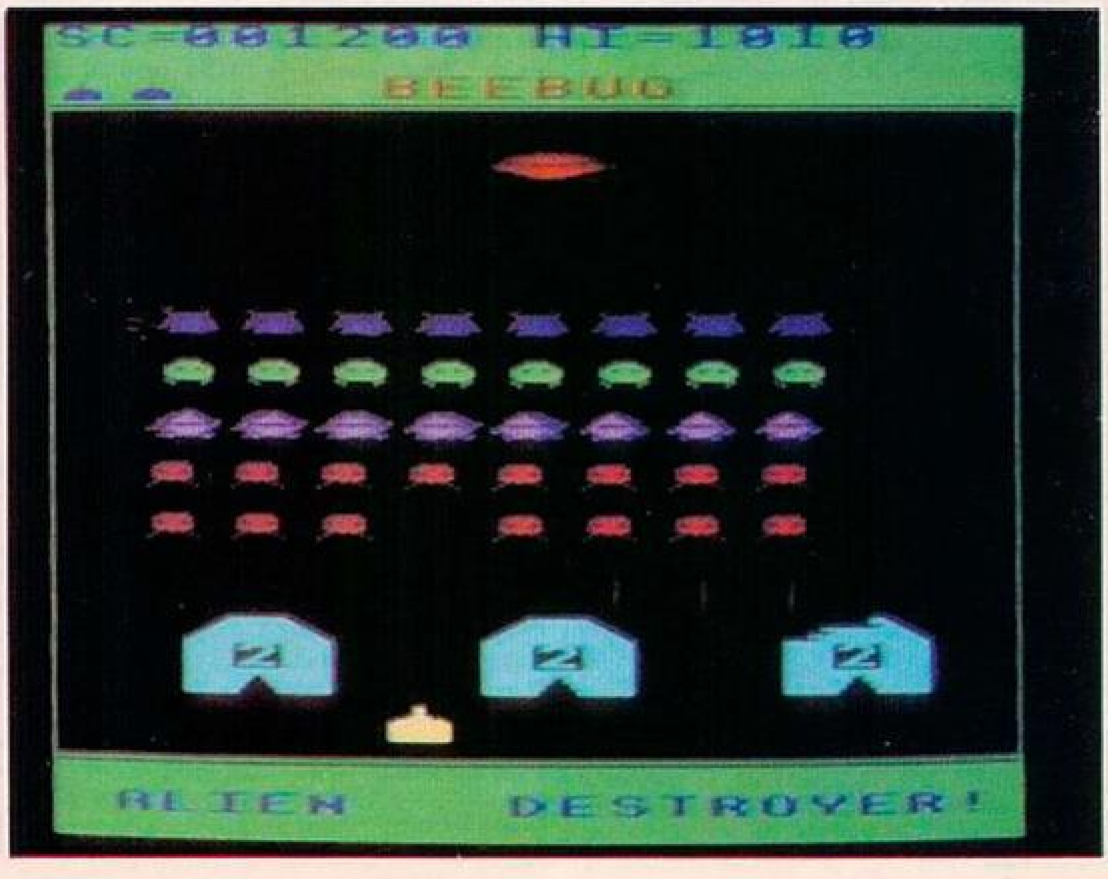
The RPVs are re-plotted on the screen every two seconds, so it's not exactly smooth scrolling. Once you have steered an aircraft to less than 2000 feet, within 50 pixels of the runway centre line (count them, 50) and 100 pixels of the dotted runway approach markers and you are heading into the wind, not to mention having a bearing within 10 degrees of the runway centre line, you get a different display showing a view of the horizon, the runway and the rear of the plane.

2002 is another landing problem — this time you're in command of a Pan-Am. Lockheed Orion space clipper of the kind popularised in Kubrick's move 2001. You have to soft-dock with the Space Hilton as it cartwheels in the outer reaches. Like ATC Simulator, this is in black and white, plots every two seconds and is pretty user-hostile. Even skilled space-shuttle pilots were scratching their heads over this one.

A subterranean scenario

In contrast, down The Mine, from Program Power, pitches us into a subterranean scenario of firebreathing dragons, red monsters, deadly mushrooms and falling rocks. It's like Dig-Dug and what the poor miner is doing down there, one can only guess. Perhaps he is a flying picket and this is the only way he can get out of his home county without being harassed by the police.

You steer your man through the bowels of the earth, seeking treasure, timing it so that the beasties following you get crushed by falling rocks and so on. You can pump creatures up to kill them, but you have to be aligned correctly. An addictive little number, this. From the depths of the earth to the thrill of the open road in Program Power's hell Driver. No relation to the wonderfully awful old British movie starring everybody from Patrick MacGoohan through to Sean Connery as truck drivers working for a highly dubious firm. Apparently the object of the game is to get to all of the check points on the sheet before your fuel runs out or you are stopped by a police car or fire engine. ■



SKRAM

Jason Charlesworth with a hill-hopping Spectrum game.



THE ALIENS have been defeated thousands of times and have decided to now live out in the open. Now the aliens are seeking revenge for their previous defeats and have built a massive missile with which they intend to destroy earth. Your mission is to fly past all their defence systems and destroy the missile.

Your space ship is equipped with photon torpedoes — you can have five torpedoes flying at anyone time — bombs and also a terrain mapping system. This produces a small picture of what the landscape is like — the left hand half — and what the next section of landscape will be like — the right hand half. Spread across the land are huts, radar posts, missiles, fuel dumps, fizzers and asteroids.

The game has four phases. In phase 1 there are lots of missiles and a few huts etc. spread across the relatively flat land. If you shoot a fuel dump you gain 50 fuel units, but if you run out of fuel, you will crash. Phase 2 gets very hilly and to make it even more difficult there are asteroids which unfortunately for you can not be shot down. Phase 3 is slightly less hilly than phase 2 and it is here you meet the fizzers, small animals which bounce up and down to get in your way. Phase 4 is a mixture of phases 1-3 and hidden somewhere in phase 4 is the missile which you must destroy.

The game features:

A high score — To get on this you must

Listing 1.

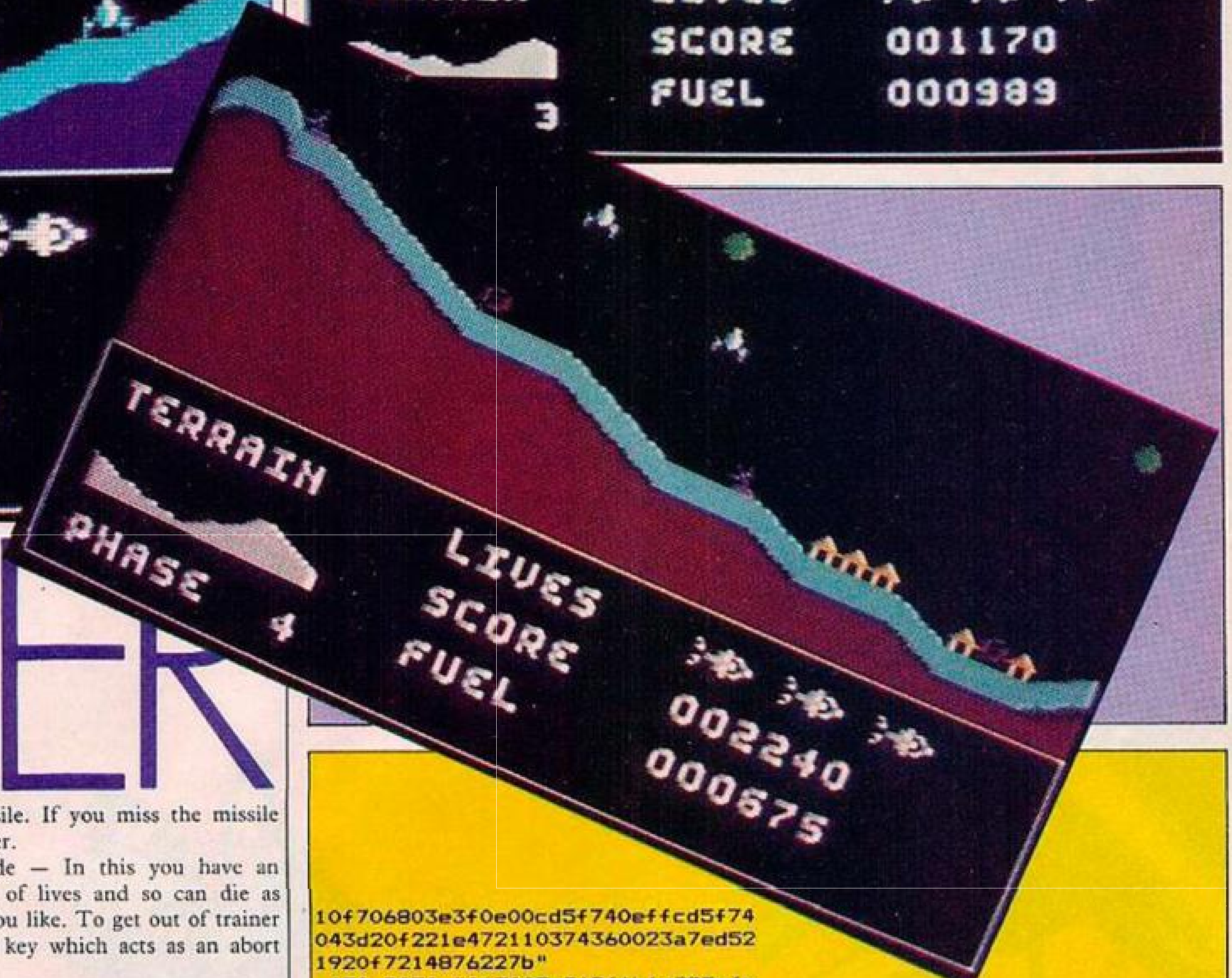
```
  1 DEF FN x(a)=10*INT (a/16)+a
-16*INT (a/16)
 10 BORDER 0: INK 7: PAPER 0: C
LEAR 27099: LOAD ""CODE
 11 LET SP=5 : LET sc=13230: LE
T h$="J.Charlesworth"
 20 POKE 23675,16: POKE 23676,1
27: POKE 23500,SP*10: INK 7: CLS
 : PRINT AT 0,3; BRIGHT 1;"";AT
1,3;"";AT 0,27;"";AT 1,27;""; BR
IGHT 0;AT 0,11; INK 5;"Bomb Alle
y"
 30 LET a=11: PRINT AT 5,a;"Q
Up";AT 7,a;"A  Down";AT 9,a;"O
Deccelerate";AT 11,a;"P  Acceler
ate";AT 13,a;"Sym.Sft  Fire Lase
r";AT 15,a;"M  Bomb"
 40 PRINT INK 4;AT 17,a;"H  Hal
t on";AT 19,a;"S  Halt off";AT 2
1,a; INK 2;"0  Abort game": PAUS
E 200: BEEP .1,0: CLS : PRINT AT
 0,13;"Menu"
 50 PRINT AT 5,10; INK 6;"1  Pl
ay game"; INK 5;AT 7,10;"2  Trai
ner mode";AT 9,10; INK 4;"3  Dem
o mode";AT 11,10; INK 3;"4  Chan
ge Speed"; INK 2;AT 13,10;"5  In
formation"; BRIGHT 1; PAPER 1; I
NK 7;AT 21,5;"Please type your o
ption"
 60 LET a$=INKEY$: IF a$>"5" OR
 a$<"1" THEN GO TO 60
 70 GO TO 100*VAL a$
 100 POKE 27366,61: RANDOMIZE US
R 27100: PRINT AT 17,20;"
 ": IF PEEK 23335 THEN GO TO 115
 110 PAUSE 1: BEEP 1,0: BEEP 1,0
: BEEP .1,0: BEEP 1,0: BEEP 1,3:
 BEEP .5,2: BEEP 1,2: BEEP 1,0:
BEEP .5,-1: BEEP 1,0: GO TO 130
 115 BEEP .3,0: BEEP .15,2: BEEP
 .15,4: BEEP .3,7: BEEP .3,5: BE
EP .4,7: BEEP .4,4
 120 LET a=FN x(PEEK 23298)+100*
FN x(PEEK 23297)+10000*FN x(PEEK
 23296)+FN x(PEEK 23301)+100*FN
x(PEEK 23300)+10000*FN x(PEEK 23
299): INK 7: CLS : IF a>sc THEN
LET sc=a: PRINT AT 5,0;"You have
 beaten the High score": INPUT "
What is your name ";h$
 130 CLS : PRINT AT 5,3; INK 5;"
The High score is held by";AT 7,
9; INK 3;h$;AT 9,5; INK 2;"With
a score of ";sc: PAUSE 200: GO T
O 20
 200 POKE 27366,0: RANDOMIZE USR
 27100: BEEP 1,0: GO TO 20
 300 POKE 23500,80: RANDOMIZE US
R 27104: BEEP 1,0: PAUSE 1: GO T
O 20
 400 CLS : PRINT AT 0,5; INK 5;"
Old speed was "; INK 4;sp: INPUT
 " New speed please"' "(0=Fast T
O 9=Slow) ";a: IF a>9 OR a<0 THE
N GO TO 400
 410 LET sp=a: GO TO 20
 500 CLS : PRINT PAPER 1; INK 7;
 BRIGHT 1;"            Information
          "
 510 PRINT AT 5,5; INK 4;"";AT 7
,5; INK 3; BRIGHT 1;"";AT 9,5; I
NK 2;""; INK 7;"/"; INK 4;"";AT
11,5; INK 6; BRIGHT 0;"";AT 13,5
; BRIGHT 1; INK 5;"";AT 15,5; IN
K 6;""
 520 LET a=9: PRINT AT 5,a;"Fizz
er = 90 points";AT 7,a;"Radar =
30 points";AT 9,a;"Fuel = 50 poi
nts";AT 10,a;"+ 50 fuel units";A
T 11,a;"Hut = 10 points";AT 13,a
;"Rocket = 80 points";AT 15,a;"A
steroid - Cannot be";AT 16,a;"de
stroyed"
 530 PAUSE 0: GO TO 20
```

Listing 2.

```
 10 DEF FN x(a$)=(CODE a$-48-(3
9 AND a$(1)>"9"))*16+CODE a$(2)-
48-(39 AND a$(2)>"9")
 20 CLEAR 30766: PRINT "Program
 2 poking in data"'"Please wait"
 30 LET x=30767: FOR a=100 TO 3
40 STEP 10: READ a$: LET t=VAL a
$( TO 5): LET a$=a$(6 TO ): IF L
EN a$<>160 THEN GO TO 60
 40 FOR b=0 TO 79
 50 LET z=FN x(a$(b*2+1 TO b*2+
2)): POKE x,z: LET t=t-z: LET x=
x+1: NEXT b: IF NOT t THEN NEXT
a: PRINT "Finished,no errors": S
TOP
 60 PRINT "Error in line ";a: S
TOP
 100 DATA "09178cd2b6ac9cd046bcd
ef6ecd636a01feefed78e601fe01c03a
245bfe0028e9c921055b7ed601277730
0e2b7ed601277730062b7ed601277797
cdad707efe00c0237efe00c0237efe00
c03e0132245bc9cd"
 110 DATA "10637046bcde86fcdf26b
cdef6ecd536ccde86fcd636acdfb6901
feefed78e601fe01c03a245bfe00c473
6a3a065bfe00c83a275bfe00c018cb3a
cc5bfe00c847c5060010fec110f8c906
32cdb36ecdd26e10"
```







BLER

destroy the missile. If you miss the missile your game is over.

A trainer mode — In this you have an infinite number of lives and so can die as many times as you like. To get out of trainer mode use the 0 key which acts as an abort key.

A demo mode — This shows all the terrain, to get out of demo mode use the abort key.

A speed change option — The speed of the game can be changed from 0 to 9 — beginners speed. It starts off at speed 5.

An information option — This prints out the values of all the objects you can destroy.

To set up the game type in listing 1 and save

(continued on page 83)

```
 120 DATA "05534f8cdf26b210e5b06
1936002310fb21000022035b2e102204
5b062021a473114473c57efe00281536
00237ec6084f23463e04328f5c3e03cd
7b742b2b2323231afe0028169712131a
c6084f131a471b1b"
 130 DATA "060933e45328f5c3e07cd
7b74131313c110c19732245bcdad703a
065b3d32065bfe00c4c86b21107f227b
5c1e040100003e17cd76750c1d20f9c9
062b21005b36002310fb3e0332065b21
1077220a5b213f77"
 140 DATA "06534220c5b3e1032045b
97328d5ccd6b0d060021005a36072310
fb062021005011e05736ff3eff122313
10f706803e3f0e00cd5f740effcd5f74
043d20f221e472110374360023a7ed52
1920f7214876227b"
 150 DATA "067005c219f6b1e297efe
ff200a231d4e23461d231d18f1cd7675
0c231d20e997cdad7097cd9c70cdc86b
21e059062036282310fbc9ff0111160c
14140a0f11ff0c11100f180c15ff0c13
150b12140cff0c15"
 160 DATA "063140d170c10ff011613
0e0a150c21107f3e07328f5c227b5c3a
065b0114115f97cd76753c0ccd76750c
0c1d20f23e17cd76750ccd7675c92110
7f227b5c21145b0605c5e57efe002810
234e2346cdb1753e"
 170 DATA "0705507ae77cdc4753600
e1c123232310e221105b237efe00280e
472b4e3e07328f5c3e02cd7b7423237e
fe00280d4f23463e07328f5c3e02cd7b
743e07328f5ced4b0e5b97cdda74c921
107f227b5c3e0732"
 180 DATA "086248f5ced4b0e5b97cd
da74cd096dcd6d6cc901fe7fed78e604
5f3a105bfe0020197bfe0428141e04ed
4b0e5b78e6f8c6084779c6104fed4310
5b3a125bfe0020173e04bb2812ed4b0e
5b78e6f8c6084779"
 190 DATA "08103c6084fed43125b21
105b0602c54e23462b97b82842e5cdb1
757ee1fe002811fe07280de5cda36de1
36002336002b182778c60847e5cdb175
7ee1fe002804fe0720e17123703e0732
8f5c11107fed537b"
 200 DATA "066845c3e02cd7b742b23
23c110b0c93a265bfe0028069732265b
181001fe7fed78e602fe0228053e0132
265b21145b0605c57efe0020243a265b
fe0120643eff32265b3e0177cdb36e23
ed4b0e5b04040404"
 210 DATA "0902179c6184f23702b71
2b234e2346e5cdb1757ee1fe00280ffe
07280be5cda36de12b2b3600182a79c6
084ffef838062b2b3600181c702b712b
e5cdc4757ee1fe0020c7e5cdb1753e07
ae77cdc47536ffe1"
 220 DATA "09599232323c11089c9c5
21107f227b5ccdd26ecdb1755e7bfe46
cab16e3a085bbbcab16e3a095bbbcab1
6e3e43bb2015328f5c79e6f84f78e6f8
473e04cd7b743e30c3a16e328f5c7bfe
06201b78e6f84779"
 230 DATA "07971e6f84fcdb1753600
97328f5c3e06cd7b743e10c3a16efe04
```

(continued on page 83)


THE HOTTEST GAMES IN TOWN FROM LLAMASOFT
HELL GATE
HELL GATE on the 64 is certainly no REVENGE or HOVER BOVVER, being the VIC 20 code tweaked to run on this system. However we are offering it at a bargain price to those who like an unusual shoot-'em-up, fans of Gridrunner and Matrix should enjoy themselves and the game is challenging to all. Available for Commmodore 64 £5.00 and VIC-20 £6.
MATRIX
Jeff Minter has taken Gridrunner – the game that topped bestseller charts in USA and UK – and created an awesome sequel.
Graphically superb: it features multiple screens, new aliens and attack waves, mystery bonuses, renegade humanoids, deflexor fields, diagonal tracking countdown/panic phase and much, much more ... Packed into 20 mind-zapping zones and accompanied by incredible sonics.
8K expansion required.
Available for Commmodore 64 £7.50 and VIC-20 £6.
LASER ZONE
Experience Laser Zone – an utterly NEW totally ORIGINAL masterpiece of Video games design. Learn to control two spaceships at once. Feel the EXHILARATION as, after long hours of practice, you control the two ships so that they function as a smooth, co-operative team! Feel the raw POWER as you lunge for the electro button and BLAST your enemies into expanding clouds of SPACE JUNK!! Feel the humiliation as a carelessly aimed BLAST slams into the side of your last remaining ship!! 8K expansion required. Available for Commodore 64 £7.50 and VIC-20 £6.
METAGALACTIC LLAMAS BATTLE AT THE EDGE OF TIME
A fast and original game for the unexpanded VIC. Challenging and colourful, with good sonics and a unique game action and design; this promises to be the most exciting new 3.5K VIC game since the introduction of GRIDRUNNER nearly a year ago. £5.50
ATTACK of the MUTANT CAMELS
Planet earth needs you! Hostile aliens have used genetic engineering to mutate camels from normally harmless beasts into 90 foot high, neutronium shielded, laser-spitting death camels!! Can you fly your tiny, manoeuvrable fighter over the mountainous landscape to weaken and destroy the camels before they invade the humans stronghold! You must withstand withering laser fire and alien UFOs. Game action stretches over 10 screen lengths and features superb scrolling, scanner 1/2 player actions and unbelievable animation! Play this game and you'll never be able to visit a zoo again without getting an itchy trigger finger! Awesome m/c action. Available for Commodore 64 £7.50.
HOVER BOVVER
A totally original arcade game for C64 featuring outstanding graphics and a sound track created by a professional Piano Wizard. Gordon Bennet has borrowed his neighbour's Air-Mo lawnmower. Mow your way through as many of the 16 lawns as you can before the pursuing neighbour retrieves his mower. Set your dog onto the neighbour to help you out of tight spots and don't annoy the gardener. Try not to plough through the neat flower beds or overheat your mower! £7.50
GRIDRUNNER
Finally true arcade quality on the unexpanded VIC! Shoot down the segmented DROIDS invading the grid. Beware of the pods and zappers! The awesome speed, sound, and graphics gives you the best blast available for unexpanded VIC. Available for VIC-20 £5.00 Commodore 64 £5.00 Atari 400/800 £7.50
REVENGE OF THE MUTANT CAMELS
At last the long awaited sequel to Attack of the Mutant Camels is available. You are controlling a ninety foot high, neutronium shielded lazer spitting death camel, leading a rebellion against your evil Zzyaxian overlords. The game features beautiful smooth scrolling graphics and no less than 42 different attack waves, more than any game in video history. The challenge of play will last for months as you battle to see what's on the next wave.
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```
(listing 2 continued from page 81)
202a21a47379e6f8a71f1f1f5f838385
300124 6f3600234e23463e04328f5c79
c6084f3e03cd7b743e901871fe422804
fe44203d3e50cdad"
 240 DATA "081137011107fed537b5c
21e47279e6f8a71f1f1f5f8383853001
246f3600234e23460397328f5c02c1c5
78e6f84779e6f84f3e05cd7b743e5018
2cfe45202d21447379e6f8a71f1f1f5f
8383853001246f36"
 250 DATA "0955700234e23463e4532
8f5c79c6084f3e07cd7b743e80cd9c70
c1c9fe47200732275b3e0018f0c1c9e5
d5c5f50614110500218c00e5d5c5cdb5
03c1d1e1a7ed5210f2f1c1d1e1c9e5d5
c5f5061421960011"
 260 DATA "0950505000e5d5c5cdb503
c1d1e11910f4f1c1d1e1c9cdc670cd57
6fcdc26fcdfc6ec921a47311107fed53
7b5c0620c57efe002842e6f05f7ee60f
57234e23463e04328f5c3e03cd7b747b
fe10280d05050505"
 270 DATA "0665728031520101e1018
0c04040404147afe0920021e203e03cd
7b7470792bd608772b7ab377c1232323
10b2c921447311107fed537b5c0620c5
7efe002836fe01200ee5cdae6f7de1e6
0ffe07202d360223"
 280 DATA "063824e23463e45328f5c
3e07cd7b740505050520062b2b360018
0acd7b74702b79d608772b232323c110
bec9237ed608772b18f12a765c292929
29ed5b785c191134d1922765cc921e4
7206207efe002816"
 290 DATA "08342235e23562b2bfe42
20043e4418023e427712231d732b2323
2310e0c9cd6870110000 01febfed78e6
10fe00200b01fefded78e602fe0020f5
01fefbed78e601fe0020021efd01fefd
ed78e601fe002002"
 300 DATA "087701e0301fedfed78e6
02fe0020021 6feed78e601fe00200216
0297ba2002bbc8ed4b0e5b21107f227b
5c3e07328f5c7902fe80380192577883
fe803801935f97cdda74434aed430e5b
cdda74c9ed4b0e5b"
 310 DATA "077041e03cdb1757efe00
2804fe07201c78c60747cdb1757efe00
2804fe07200c78d6074779c6074f1d20
d9c93e0132245bc921005b5f3e07328f
5c7b011413cddf75c9e5d5c5f521035b
5f3e07328f5c7b01"
 320 DATA "091661415cddf75f1c1d1
e1c9e5d5c5f5cd4d71cda672cd7171cd
db70f1c1d1e1c92a0a5ba711e07eed52
193808 3e0132065b32245b11487 6ed53
7b5c3e07328f5c3a075b010816cd7675
11050ded53085b3e"
 330 DATA "0663001320 75b111079a7
ed5219d8110129ed53085b3e0232075b
11107ba7ed5219d811020aed53085b3e
0332075b11107da7ed5219d811051 5ed
53085b3e0432075bc92a0c5b7ee60fc6
98470e4778fea828"
 340 DATA "076550 6cd5f740418f523
7efe80300123220c5bcd0474c9cd1d74
21107f227b5c2a0a5be57ee60f470e1f
7ee670a71f1f1fc60e5f3a085b328f5c
7bcd76753a095b328f5c0478fe102825
7b3ccd7675c50ef0"
```

(continued from page 81)

it on to tape using SAVE "Bomb Alley" LINE 1. Now comes the difficult bit, typing in the machine code. Because of the data used in ghe game — 2K of data for the scenery and ½K of data for the characters — the program is long the machine code and data together take 5.6K.

The machine code is put in three programs, listings 2-4. First type in listing 2 and run it. If any error is found in the data the program will tell you which line needs changing. When the data is all poked in correctly, save it with

SAVE "CODE1"CODE 30767,2000

Repeat this for listing 3 and listing 4 saving them with

SAVE "CODE2"CODE 30767,2000

and SAVE "CODE3"CODE 30767,2000

respectively. Now rewind the cassette and type

CLEAR 27099:LOAD"CODE1"CODE27100: LOAD"CODE2"CODE29100:LOAD"CODE 3"CODE31100

When this has finished loading all the code, save the whole block directly after Bomb Alley with

SAVE "CODE"CODE 27100,5667

The game is now ready to play. To play it rewind the cassette and type LOAD "". ■

Listing 3.

```
  10 DEF FN x(a$)=16*(CODE a$-48
-(39 AND a$(1)>"9"))+CODE a$(2)-
48-(39 AND a$(2)>"9")
  20 CLEAR 30766: LET x=30767: P
RINT "Program 3 poking in data"'
"Please wait"
  30 FOR a=100 TO 340 STEP 10: R
EAD a$: LET t=VAL a$( TO 5): LET
 a$=a$(6 TO ): IF LEN a$<>160 TH
EN GO TO 60
  40 FOR b=0 TO 79
  50 LET z=FN x(a$(b*2+1 TO b*2+
2)): POKE x,z: LET x=x+1: LET t=
t-z: NEXT b: IF NOT t THEN NEXT
a: PRINT "Finished,no errors": S
TOP
  60 PRINT "Error in line ";a
 100 DATA "0836204a7cb10cb10cb10
cdb175c13a095b4f0478fe1028077111
20001918f3e123220a5b7ee680fe00c0
e57ee60f470e1f7ee6f0a71f1f1ffe
05d26e72fe0020213e15320174c5a7cb
10cb10cb100ef8ed"
 110 DATA "077654302743e04328f5c
c13e03cd7675c3a072fe01200d3e4332
8f5c3e04cd7675c3a072fe0220203e42
328f5c3e05cd7675a7cb10cb10cb100e
f8cdb1753e42324173224273185efe03
200a3e06328f5ccd"
 120 DATA "07250767518503e45328f
5c3e07cd7675a7cb10cb10cb100ef8ed
43a2733e0132a1731832fe05201 30d3e
46328f5c3e08cd76750c3e09cd767518
1b3e47328f5c0d3e0acd76753c0ccd76
753c040dcd76753c"
 130 DATA "068660ccd7675e123220a
5bc921e77211e4720150d0097edb03243
73324273324173 21a77311a473015d00
edb03203743202743201742147731144
73015d00edb032a37332a27332a173c9
0000000000000000"
 140 DATA "004020000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
000000000000000000000000042b35900
00000000000000000000000000000000
0000000000000044"
 150 DATA "012365c59425d59445e59
00b82000000000000000000000000000
00000000000000000000000000000000
0000000000580400000000000000000 0
00000000000000000000906800000000
00000000000000000"
 160 DATA "0028000b86000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
00000000000000000"
 170 DATA "038490000000000000000
00000000000000000000000000000000
00000000000000000000000000000000
06980e47c5cdc475a706087e17772b10
fac1043ea8b820ecc93e80110040626b
23011f00edb02b36"
 180 DATA "0912700231 33d20f23e10
110058626b23011f00edb02b36002313
3d20f2c9e5c5cdc475fe002808477ea7
1710fc18017ee680c1e1c9e5c5f5cdc4
75fe00280a473e80a71f10fdb618037e
f68077f1c1e1c9f5"
 190 DATA "08066e5d5c5ed5b7b5c87
8787833001145fcdc475e57c0f0f0fe6
03f658673a8f5cae7722b05ce13e0808
1aae77083d281008137c043ce6072004
cdc4752524 18e97c0f0f0fe603f65867
3ab05cbd20063ab1"
 200 DATA "097525cbc28053a8f5cae
77c1d1e1f1c9f5c5d5e52a7b5c878787
853001246fe5dde1cdc47532815ce57c
0f0f0fe603f658673a8f5c5f22b05cae
77237eab77237eab77e13e0808c53a81
5cdd5e00dd560847"
 210 DATA "07766afb82808a7cb1bcb
1a1f10f92323ae772b7eaa772b7eab77
083d281508dd237cc13ce607200604cd
c475052524041 8c5c17c0f0f0fe603f6
58673ab05cbd20063ab15cbc280e3a8f
5c5fae77237eab77"
 220 DATA "09553237eab77c1e1d1c1
f1c9e5d5c5f5a7cb10cb10cb10cb11cb
11cb11171717ed5b7b5c833001145fcd
c47506081a771324 10fa257c0f0f0fe6
03f658673a8f5c77f1c1d1e1c90878e6
f826166f292979e6"
 230 DATA "08717f01f1f1f856f08c9
78a71f371fa71fa8e6f8a86779070707
a8e6c7a807076f79e607c9e5d5c5f511
4876ed537b5c1e03e52323862777300e
2b7ec6012777300 62b7ec6012777e17e
f5e6f01f1f1f1fcd"
 240 DATA "0461276750cf1e60fcd76
750c231d20e9f1c1d1e1c9d1e1c90000
00000000000000000000000000000000
00000000000000000000000000000000
000000003c7e666666667e3c18381818
18183c3c7c7e063e"
 250 DATA "072127c607e7e7c7e061e
1e067e7c0c1c3c6c7e7e0c0c7e7e607c
7e067e7c3e7e607c7e667e3c7e7e060c
183030303c7e667e7e667e3c3c7e667e
3e067e7c3c7e667e7e666666 3e7e6060
60607e3e3e7e6078"
 260 DATA "0799678607e3e3e7e607c
7c6060606666667e7e6666667e7e1818
18187e7e6060606060607e7e6666767e
6e666666 3c7e666666667e3c7c7e6666
7e7c60607c7e66667e7c6c663e7e607c
3e067e7c7e7e1818"
 270 DATA "11112181818186666666 6
66667e3c666666666666663c18cfcfcfcf
cfcf1ecf1ecf1e8eae8dadcd4ccd4ccd
4cedce2ddddcdbdad9c918c918e9ca49
eacb4acb4acb4adaca49caca4989f999
eacb2acb2acb3acb"
 280 DATA "120404a8aaa89a9c938e9
ca49ca49eaebecedce2dce4dce4d8dad
cd4c8caccc4bcc4bcc1bdbdad9d8c847
e8e9eacb4aebeccd4ccd2ccd3ccd1ccd
1c8cac8babcb1a8aaaca19eacb4aebcc
bc9ccd4ccddcdbcb"
 290 DATA "122911aebbc9ccd1ccd4c
edce4ddddccc4bcc1b8babcb1abb9bcc
4bbc9ccd1cedce4deecf2edece1dce4d
8dfdadcd4cbd9dce1d8dadcd4c8caccc
4b8babbb9bcc4bcccc1bbc9ccd4cbd9d
ce4dcece4dcece4d"
 300 DATA "12711cece4dceeecf4ecf
de8dadcd4c8caccc1b8babcb4acb8a9a
bb9bcc4bcc1b8babcb1abb9bbc9ccd4c
bd9dce4dbefeaece1d8dadcd4ccd1c8c
ac8babcb4acbcb4aebecedce4dce4d8d
addcdbcb4adaca49"
 310 DATA "12611ca19ba9acb1a8aaa
ca19ba9acb4abb9bbc9ccd4ccd8caccc
1bcc4becedce4ddddcdbdaca19caba9a
cb4acb4abb9bcc4beccd4ccdcd4ccdcd
4cbdfd9dce4dcece1dcece4d8dad8cac
cc4bcccc3bcc4b8b"
 320 DATA "12416abcb3a8aaaca29ca
ba9acb4abb9bccbc9ccd3ccd3cbd9dce
2dcece4d8dadcd4c8cac8bab8aaa49ca
89a9c928c9b999ca29ba9acb4aebcc4b
cc8babcb4acbcb4aebecbd9dce4dcece
1dcece1d8dadcd4c"
 330 DATA "12366cdcd4c8caccc1bcc
cc2bdbcb4aebcc4bcccc4bbc9ccd1cbd
9dce4dcece1d8dadcd2c8caccc2bbc9c
cd2ccdcd4cbd9dce1dcece8dadcd4ccd
bd9dce2d8dad8caccc3bcccc1b8bab55
8aaad952d8d7c7c7"
 340 DATA "1306554e7c847c8e8c948
e9ca19ea55cb3aeb52cc2beccd2ccdcd
4ced54ce2d8daddccc4bdbda52cad9d8
d7d6c645c6e6e7e8b95299ca2989a9d8
d7d6d5d48350a3c322b393c443e4c544
e5e6e752b898c928"
```

Listing 4.

```
  10 DEF FN x(a$)=16*(CODE a$-48
-(39 AND a$(1)>"9"))+CODE a$(2)-
48-(39 AND a$(2)>"9")
  20 CLEAR 30766: LET x=30767: P
RINT "Program 4 poking in data"'
"Please wait"
  30 FOR a=100 TO 300 STEP 10: R
EAD a$: LET t=VAL a$( TO 5): LET
 a$=a$(6 TO ): IF LEN a$<>160 TH
EN GO TO 60
  40 FOR b=0 TO 79
  50 LET z=FN x(a$(b*2+1 TO b*2+
2)): POKE x,z: LET t=t-z: LET x=
x+1: NEXT b: IF NOT t THEN NEXT
a: PRINT "Finished,no errors": S
TOP
  60 PRINT "Error in line ";a
 100 DATA "12737c92888a85487a7c7
46c751d6d5c544d4c413c4e4e5e6b753
97c8c817e8e9eaebbcfcaccc4bcc518b
ab55cb4adaca19ea52cb4adad988a8c8
47c8d7d6c625d552c544c514c544e5c6
35e6c736c736e7e8"
 110 DATA "1238251c938c938b999ca
49caeaeb54ecbd9dce4dce2d8d56fdad
cd4ccd1c8c52acdbcb2acb2acb2ada54
d9d8d7c746d65185a5d4c4b494b595c6
45c651c64585a5c514e5e6e752b898c9
38c9c938b999eabb"
 120 DATA "12086559b53cc2becedce
2dcece2ddd55dc8babcb4acb2abb9b53
cc2bdbdad951d887a7c73686a6c61585
50a5d4c423c4c44383a3c312e3c433e4
e551c534b5f595b696e751c847e8c918
c9c938b999ea54cb"
 130 DATA "123502aebeccd2c8c51ac
dbcb4adaca39d9d8d753c736c78696c7
46d605a5c53484f494c514b595e6e752
b898c948b999ca49ca51ca29caca49ca
55ca29ba9acb2acbcb4abb9b53cc1bdb
dad98852a8d78 6f6"
 140 DATA "12819a6c625d5d4d3c342
c3c312e3e4b595c635c650c615b69652
c74686a6c64585a5d4c413c48393e4e5
e652e7e8e9eaeb56ecbd9dce4dcece52
ce4d8ddccc1bdbcb4ada54ca29d9c948
d8c047d751c746d6"
 150 DATA "11734c645c6c615c6b696
b797b898c928c9c918b999ba9a04cb3a
cbcb4a8aaaca19ba9abb049bbc9ccd2c
cd06cd1c8cac05cc4bcccc2b8b06ab8a
04aad9d8d7c716d6c6d5c534c5c53484
94b595b696e7e8e9"
 160 DATA "11786eaeb05bc9c04cd4c
8caccc1bcc05cc3b8b04ab8aaaca29ca
04ca2989a9d8d7d685a5c534c5b595e6
e7e8e904ba9acb4a8afaaaca29cacaba
049abb9b06ecedce1dce04ce4d8dad8c
ac07dbdaca49ca89"
 170 DATA "1257104a9c948c9b999ca
39d9d8d7d685a5c524c5c544b595e6e7
e8e9eabb049bcc4bbc9ccd1ccdcd4c8c
acdbda0489a9c93888a8c8e8e9ba9acb
2acbcb4abb9bbc9c04bd9dce1dce08ce
3d8daddcdbdad904"
 180 DATA "12118c918d8d7d6c61585
a5d4d3c342b393c4b494c544c584a4c4
13b494b595e6e7e8e9ba049acb2acbcb
4abb9bbc059ccd4ccd2ccd4c8cac02cc
1b8bab8aaaca39ca04ca1909a900a8d7
d6d5d483a3c342c3"
 190 DATA "11533c322b393b494e5e6
b797c827b898c918b90499ca19ba9acb
4abb059bcc2bbc9ccd4cbd9d07ce2dce
1d8dad048cac8b06abdad904d887a786
a685a5c5c54484a4c423b494b595e6e7
b898c918c9c938b9"
 200 DATA "114099904ca19caca39ba
9abb9b05bc9c04cd1cbd9d06ce3d8dad
8caccc4bcc06cc2b8bab058aaaca49ca
ca4989a904d8d7d6c645c6c625d5d4c4
23e4e5b696c746b797c847c8c8478797
b8a887a7c726c7c7"
 210 DATA "1174616b797b898b90499
ba9acb4abb9bbc9c05cd1ccdcd3cbd9d
ce1dce06ce3d8dadcd1ccd06cd2c8cac
dbdad904d88797c847c8c847d7e7e8e9
ba529acb4acbcb2a8aaa04d988a8c817
e8e9ca29caca3989"
 220 DATA "13190a904d8d786a6c635
85a5845294e5c635d5c544e5e6e7c847
d751e736e7e8e9ca49d9c938e953eacb
4acb05cb2adad9d8c817d751d6d5d4d3
c312e3e4c534d4c423e4e5e6c746d6c6
35e6e7e8c930d8d7"
 230 DATA "11048d6c645e6c716b797
b898b99952ca29caca49ba9abb9b05cc
4bcccc1bbc9c04cd3ccd3ccd3cbd9dce
3dce2dce3d8d04ad8cacdbdaca39caca
39d9c918d8c847d7d652d5d4c423c4c4
43b494c544e5c645"
 240 DATA "12106e6c736e7c837e8c9
18e9ca49eacb4aebcc1bbc9ccd2ccd05
cd3cbd9dce3dce07ce3d8dadcd3cbd04
9dce4d8daddc51dbdad904c938d8d7d6
85a5c54484a4c433c433c433b494e5e6
e7e852c928c9c948"
 250 DATA "11200c9c948b99904ca19
ca49ca29ca49ca198904a9c928c948c9
48889852b999ba9acb3acbcb3a8aaaca
39ca29ca39ca29ca39ba9acb04ecbd9d
ce4dce4dce4dce4dce4d8d05adcd4ccd
4ccd4cdcdb54dad9"
 260 DATA "13609c948d887a7c716c7
c736b797c827c827c827b898e9eacb04
cb1acbebcc52eccd3ccd2ccd2ccd3cdc
dbcb05daca39d9d8d7c7c7c7c7c7e7e8
c9c967d8d7c7c7c7c7c7c7c7c7c7c7c7
c7c7c7c7c7c7c7c7"
 270 DATA "15393c7c7c7c7c7c7c7c7
c7c7c7c7c7c7c7c7c7c7c7c7c7c7c7c7
c7c7c7c7c7c7c7c7c7c7c7c7c7c7c7c7
c7c7c7c7c7c7c7c7c7c7c7c7c7c7c7c7
c7c7c7c7c7c7c7c7c7c7c7c7c7c023e31f
1fe323c0c0f8ccf7"
 280 DATA "07280f7ccf8c000000010
38100000187e7effff7e7e18084 83030
e8083e7f3ce3efe7ef3c42a500183c7e
ff66666618183c3cbddb81818109345ef6
5e74190000886401d880380000000001
0103020600808 0c0"
 290 DATA "10253c060a0b027272f33
21202020f2f2faebc202020200000000
031f7fffffffffffce0800000000000 0
c0f8feffffffffff34070100031f7fff
ffffffffce08000000000000c0f8feff
ffffffff3f070100"
 300 DATA "0816000000000 0ffffffff
ffffffff0d000000000000000030f143f
7f7ffffffcf0e0c080800000c0f0f8fc
fefeffff3f0f07030101000000000000
ffffffffffffffff0000000000000000
0000000000000000"
```

```
1 REM***************
2 REM* CODE  DATA *
3 REM*    BY     *
4 REM* DAVID REES *
5 REM***************
10 FORN=0TO14:FORM=0TO255:READA:IFA=-1THEN30
20 POKE49152+N*64+M,A:C=C+A:NEXTM
30 NEXTN
50 FORN=0TO255:POKE16384+N,255:NEXT
60 POKE16128,128:POKE16129,64
70 POKE51,250:POKE55,250:POKE52,62:POKE56,62
80 PRINT"CHECKSUM SHOULD BE: 97914"
90 PRINT"THEN CHECKSUM IS:"C
5000 DATA173,1,63,133,252,133,254
5010 DATA173,,63,133,251,24,105,32,144,3
5020 DATA24,230,254,133,253,173,,63
5030 DATA205,2,63,208,8,173,1,63,205,3,63
5035 DATA200,1,96,160,,177,251
5040 DATA145,253,200,192,32,208,247
5050 DATA165,251,56,233,32,176,2,198,252
5060 DATA24,133,251,165,253,56,233,32
5070 DATA176,2,198,254,24,133,253
5080 DATA205,2,63,208,216,165,254,205,3,63
5090 DATA208,209,173,,63,24,105,32,144,4
5100 DATA24,238,1,63,141,,63,96,-1,-1
5200 DATA173,3,63,133,252,133,254
5210 DATA173,2,63,133,253,24,105,32,144,3
5220 DATA24,230,252,133,251,173,,63
5230 DATA205,2,63,208,9,173,1,63,205,3,63
5235 DATA208,1,96,160,,177,251
5240 DATA145,253,200,192,32,208,247
5250 DATA165,251,24,105,32,144,3,24,230,252
5260 DATA133,251,165,253,24,105,32
5270 DATA144,3,24,230,254,133,253
5280 DATA205,,63,208,216,165,254,205,1,63
5290 DATA208,209,173,,63,56,233,32,176,3
5300 DATA206,1,63,24,141,,63,96,-1,-1
5400 DATA160,,177,251,133,2,177,253
5410 DATA197,2,208,6,200,192,16,208,241
5420 DATA96,56,229,2,144,2,24,96,160,
5430 DATA177,251,133,2,177,253,145,251
5440 DATA165,2,145,253,200,192,32
5450 DATA208,239,96,-1
5490 REM
5500 DATA169,,133,251,169,64
5510 DATA133,252,162,,220,75,208,1,96
5520 DATA160,,177,251,201,255,240,15
5530 DATA165,251,24,105,32,144,3,24
5540 DATA230,252,133,251,24,144,235
5550 DATA232,228,75,208,236,165,251
5560 DATA24,105,32,144,3,24,230,252
5570 DATA133,251,96,-1
5690 REM*SORT INIT*
5700 DATA32,64,193,230,75,165,252
5710 DATA133,77,133,79
5720 DATA165,251,133,76,24,105,32,144,3
5730 DATA24,230,79,133,78,32,64,193
5740 DATA165,252,133,81,165,251,56,233,32
5750 DATA176,2,198,81,24,133,80,165,76
5760 DATA133,251,165,77,133,252,165,78
5770 DATA133,253,165,79,133,254,197,81
5780 DATA208,9,165,78,197,80,208,3,169
5790 DATA13,96,165,76,197,80,208,9
5800 DATA165,77,197,81,208,3,24,144,230
5810 DATA169,,96,-1,-1
5890 REM
5900 DATA32,,193,165,251,24,105,32
5910 DATA144,3,24,230,252,133,251
5920 DATA165,253,24,105,32,144,3,24
5930 DATA230,254,133,253,197,80,208,225
5940 DATA165,254,197,81,208,219,165,80
5950 DATA56,233,32,176,2,198,81,24
5960 DATA133,80,197,78,208,203,165,81
5970 DATA197,79,208,190,96,-1
6000 DATA32,128,193,240,1,96,32,,194,96,-1
6090 REM*SORT SHORT*
6100 DATA32,128,193,240,1,96,32,,193,165,251
6110 DATA24,105,32,144,3,24,230,252
6120 DATA133,251,165,253,24,105,32
6130 DATA144,3,24,230,254,133,253,197,80
6140 DATA208,225,165,254,197,81,208,219
6150 DATA96,-1
6199 REM*S/L*
6200 DATA173,1,63,133,254,173,,63,24
6210 DATA105,32,144,3,24,230,254,133,253
6220 DATA169,,133,251,169,63,133,252
6230 DATA162,1,160,255,32,186,255,169,
6240 DATA32,189,255,169,251,166,253
6250 DATA164,254,32,216,255,96
6260 DATA162,1,160,255,32,186,255
6270 DATA169,,32,189,255,162,255,160,255
6280 DATA32,213,255,96,-1,-1
6299 REM*GET*
6300 DATA32,64,193,160,,177,251,201,255
6310 DATA208,4,141,,204,96,105,64,63,240,17
6320 DATA177,251,57,96,63,133,2
6330 DATA165,32,63,57,96,63,197,2,208,0
6340 DATA208,192,32,200,219,76,128,195
6350 DATA165,251,24,105,32,144,3,24
6360 DATA230,252,133,251,24,144,199
6370 DATA-1
6399 REM
6400 DATA169,,96,165,1,41,254,9,6,133,1,96
6410 DATA165,1,234,9,7,133,1,96
6420 DATA32,131,195,32,128,193,32,140,195,96
6430 DATA32,131,195,32,,192,32,140,195,96
6440 DATA32,131,195,32,128,194,32,140,195,96
6450 DATA32,131,195,32,64,195,32,140,195,96
6460 DATA32,131,195,32,66,195,32,140,195,96
6470 DATA32,131,195,32,64,192,32,140,195,96
6480 DATA32,131,195,32,192,194,32,140,195,96
6490 DATA32,131,195,32,240,194,32,140,195,96
6500 DATA32,131,195,32,64,193,32,140,195,96
6510 DATA32,131,195,32,189,195,32,140,195,96
6520 DATA32,131,195,32,128,192,32,140,195,96
6700 DATA-1
READY.
```



David Rees with a micro filing system.

CBM FILES

The following program is a cassette-based filing system for the Commodore 64. It can accommodate up to 1,000 different entrys, and, after the file has been loaded, allows very fast and easy manipulation of the data.

The reason that it is so fast is that the data is stored bytewise in memory, all routines having to access this being in machine code. As none of the file is stored as space wasting variables and part of it is stored in the 8K or RAM hidden by the Basic ROM — 40960 to 49512 — a large number of entries can be

```
1 REM*MAIN PROGRAM*
2 IFPEEK(49152)<>173THENPRINT"NO MACHINE CODE":END
4 V=53248:POKEV+32,0:POKEV+33,0
8 E$="I CANNOT FIND THIS DATA"
10 DIMP(14),Z(32),O$(16),AN$(13):PR=0
12 SN$="":CN$="":SE=0:SX=0
14 O$(0)="X":O$(1)="M":SX$(0)="M":SX$(1)="F"
16 O$(2)="S":O$(3)="G"
18 O$(4)="R":O$(5)="M"
20 O$(6)="S":O$(7)="G":O$(8)="R"
22 F$(0)="H":F$(1)="C":F$(2)="S"
24 F$(3)="B":F$(4)="L":F$(5)="W"
26 AN$(0)="SURNAME":AN$(1)="CHRISTIAN NAME"
27 AN$(2)="FORM":AN$(3)="SEX"
29 FORN=0TO5:AN$(N+8)="OPTION NO."+STR$(N+1):NEXT
30 SN$="REAS":CN$="DAVID":Y=2:SE=3:SX=1
40 Z(0)=0:Z(1)=0:Z(2)=0:Z(26)=0
96 YY$(2)="ND":YY$(3)="RD":YY$(4)="TH":YY$(5)="TH"
98 SU$(0)="MATHS":SU$(1)="ENGLISH":SU$(2)="   ":SU$(3)="   "
99 FORN=0TO3:AN$(N+4)="SUBJECT SET "+SU$(N):NEXT
100 PRINT"OPTIONS CHOICE"
102 PRINT"1) DISPLAY A GIVEN SET OF DATA"
104 PRINT"2) ADD NEW PUPILS TO A YEAR GROUP"
106 PRINT"3) CHANGE PUPILS DATA"
108 PRINT"4) DELETE A PUPIL"
110 PRINT"5) LOAD FILES"
112 PRINT"6) SAVE FILES"
114 PRINT"7) CHANGE 0-2;2-3;3-4;5-0TH YEAR"
116 PRINT"8) END"
120 GETA$:A=VAL(A$):IFA=0THEN120
122 IFA=8THEN950
124 IFA=9THEN120
126 ONAGOSUB200,400,500,700,800,830,860
128 GOTO100
200 PRINT"CHOICE OF DATA TO BE DISPLAYED"
201 PRINT"  DISPLAY:"
202 PRINT"1) A GIVEN SUBJECT SET"
204 PRINT"2) AN OPTIONS SUBJECT GROUP"
206 PRINT"3) A GIVEN FORM"
208 PRINT"4) A GIVEN YEAR BY FORMS"
210 PRINT"5) A GIVEN YEAR BY SUBJECT SETS"
212 PRINT"6) RETURN TO OPTIONS"
214 GETA$:A=VAL(A$):IFA=0THEN214
216 IFA=6THENRETURN
218 IFA>5THEN214
220 PRINT"SCREEN(1) OR PRINTER(2) OUTPUT"
222 GETP$:PR=VAL(P$):IFPR<1ORPR>2THEN222
226 PR=PR-1
228 PRINT"WHICH DATA IS TO BE DISPLAYED (ANSWER Y OR N)"
230 FORN=0TO13
232 PRINTAN$(N),
234 GETA$:IFA$<>"Y"ANDA$<>"N"THEN234
236 P(N)=-(A$="Y"):PRINTA$
238 NEXT
240 GOSUB940
250 ONAGOTO252,272,290,302,326
252 PRINT"TO DISPLAY A GIVEN SUBJECT SET"
254 PRINT"PLEASE INPUT THE SUBJECT"
256 INPUTS$
258 FORO=0TO3
260 IFS$=SU$(O)THEN266
262 NEXT
264 PRINT"INVALID SUBJECT":GOTO254
266 PRINT"PLEASE INPUT THE SET (RANGE 0-15)"
267 DD=27+INT(O/2):KK=15:IFINT(O/2)<>O/2THENKK=240
268 INPUTSE:IFSE<0ORSE>15THENPRINT"TRY AGAIN":GOTO268
270 S(O)=SE:GOTO380
272 PRINT"TO DISPLAY AN OPTIONS SUBJECT GROUP"
274 PRINT"PLEASE ENTER OPTIONS NUMBER (1-6)"
276 GETA$:A=VAL(A$):IFA<0ORA>6THEN276
278 O=A-1
280 PRINT"PLEASE ENTER SUBJECT"
282 GETA$:IFA$=""THEN282
284 FORN=0TO15:IFA$=O$(N)THEN288
286 NEXT:GOTO282
287 DD=29+INT(O/2):KK=15:IFINT(O/2)<>O/2THENKK=240
288 GOTO380
290 PRINT"DISPLAY A GIVEN FORM"
292 PRINT"PLEASE ENTER FORM LETTER"
294 GETA$:IFA$=""THEN294
296 FORSE=0TO5:IFA$=F$(SE)THEN300
298 NEXT:GOTO294
300 DD=26:KK=56:GOTO380
302 IFPR=1THENOPEN1,4
303 PRINT"TO DISPLAY YEAR"Y" BY FORMS"
304 FORN=0TO31:Z(N)=0:NEXT
306 Z(26)=56
308 FORKK=0TO5
```

Figure 2. One Entry (32 bytes)

BYTE NO.: 0	1314	2526	2627		2829			31
Description:	Surname	Christian Name	Bits 0-2 Year (Y) 3-5 Set (SE) 6 Sex (SX)	0-3 5(0) 4-7 5(1)	0-3 5(2) 4-7 5(3)	0-3 0(0) 4-7 0(1)	0-3 0(2) 4-7 0(3)	0-3 0(4) 4-7 0(5)
E.g.	HALL	CLARE	Y = 5 SE = 2 SX = 1 (Group 4) · H (F)	3 5	2 1	History Music	Geog Chem	Phys Biol

stored. An added bonus is that the Basic program can be stopped — e.g., as a mistake or to check the listing — and the file will remain unaffected. You can simply start the program again to find everything intact.

The whole program can be thought of as being in four parts. Part 1 is the machine code, loaded from Basic data in listing 1. Please be careful when entering this data, as one mistake could cause the whole program to crash. The check sum is there to help, but it is not infallable e.g., if one number is too high, and one too low the checksum could stay the same. Thus, it is always best to save the program before you try it out.

Parts 2 and 3 in the main program will probably be the most important parts to you. Part 4 is your own file, loaded and saved by the earlier programs. The Basic part is set up as an example of use for a school, with four years, six forms per year, and numerous sets which cross form, but not year, boundaries. Name, sex, year, form, subject and options are stored in the file.

The great advantage of putting main program control in Basic is that it is easily changed. To simply adapt the program, all you have to do is change variable limits, strings at the beginning, and text — e.g. replacing "year" with "office number". To help with this, table 1 gives a list of variables.

The program itself is fairly complete, allowing diverse manipulation of data, deletion, alteration and printouts — on a Vic 1525 printer. Each action — except saving and loading — takes less than two seconds, so there are no annoying delays. There is even a check number, incremented with each file save.

Saving and loading are fast for the Commodore 64, taking roughly two seconds per three entrys. Even if you are not satisfied with three facilities, there is still anoter 5K of room for more Basic routines. All the above has been to do with Part 2 — everything up to line 997. Even this is no the end of the program flexibility. Figure 2 shows the present structure of each enry, and figure 1 shows how it lies in the main file. If you are not satisfied with this layout — e.g., you want less options, but longer names — you can change the entry structure by altering Part 3 — lines 998 onwards.

Lines 1070 to 1210 and lines 1600 to 1690 respectively enter and read entries, so by altering these you can change the layout of figure 2 — see table 1 for which variables do what. Also the limits of Y — see lines 1000 to 1020 and others — can be changed to provide more or less groups up to a maximum of seven, so changing figure 1.

Figure 1.

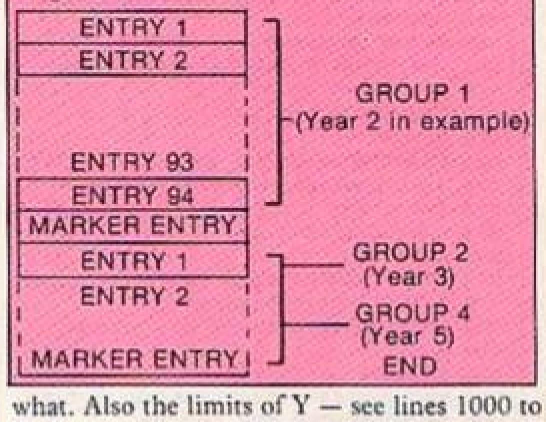


Table 1.

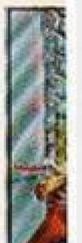
Y	Year, or group number.
SN$	Surname string.
CN$	Christian name string.
SE	Set number
SX	Sex
O$(16)	Options strings for each number (0-15).
F$(7)	Strings for each form.
Z(31)	Anding number for sorting entrys.

```
310 A$="FORM"+STR$(Y)+F$(KK)+"":SE=KK
312 IFPR=0THENPRINTA$:GOTO316
314 PRINT#1,A$
316 GOSUB1500:IFE=1THEN320
318 GOSUB2100:IFE<>1THEN318
320 E=0:SN$="  ":CN$="  ":NEXTKK
322 IFPR=1THENCLOSE1:PR=0
324 GOTO392
326 PRINT"TO DISPLAY YEAR"Y" BY SUBJECT SETS"
328 PRINT"WHICH SUBJECT DO YOU WISH TO CHOOSE?"
330 FORN=0TO3:PRINT""N+1,SU$(N):NEXT
332 PRINT"ENTER NUMBER"
334 GETSU$:SU=VAL(SU$):IFSU<1ORSU>4THEN334
336 SU=SU-1
339 FORN=0TO31:Z(N)=0:NEXT
340 KK=15:IFINT(SU/2)<>SU/2THENKK=240
342 Z(27+INT(SU/2))=KK
344 IFPR=1THENOPEN1,4
346 FORKK=0TO15
348 S(SU)=KK:A$=""+SU$(SU)+" SET"+STR$(KK)+""
350 IFPR=0THENPRINTA$:GOTO354
352 PRINT#1,A$
354 GOSUB1500:IFE=1THEN358
356 GOSUB2100:IFE<>1THEN356
358 NEXTKK
360 IFPR=1THENCLOSE1:PR=0
362 GOTO392
380 IFP=1THENOPEN1,4
382 FORN=0TO31:Z(N)=0:NEXT
383 IFPR=1THENOPEN1,4
384 Z(DD)=KK:PRINT""
386 GOSUB1500:IFE=1THENRETURN
388 GOSUB2100:IFE<>1THEN388
390 IFPR=1THENCLOSE1:PR=0
392 PRINT"PRESS ANY KEY TO RETURN TO OPTIONS"
394 GETA$:IFA$=""THEN394
396 RETURN
400 PRINT"TO ADD NEW PUPILS TO A YEAR GROUP"
402 GOSUB940
406 FORN=0TO13:P(N)=1:NEXT
408 PRINT"HOW MANY PUPILS ARE TO BE ADDED"
410 INPUTA:IFA<1THENRETURN
412 PRINT""A"PUPIL IS";:IFA>1THENPRINT"S ARE";
414 PRINT" BE ADDED TO THE"Y;YY$(Y)" YEAR"
416 GOSUB900:IFC=0THENPRINT"TRY AGAIN":GOTO402
418 FORNN=1TOA
420 PRINT"PUPIL NUMBER"NN""
422 GOSUB562
426 GOSUB568
430 GOSUB574
440 GOSUB586
446 PRINT"SUBJECT SET NUMBER:ENTER 0 IF NO SET"
450 FORN=0TO3
452 PRINT"ENTER "SU$(N)" SET"
454 INPUTS(N):IFS(N)<0ORS(N)>15THEN452
456 NEXT
458 PRINT"SUBJECT WITHIN AN OPTION"
460 PRINT"ENTER 'X' IF NO SUBJECT IS REQUIRED"
461 FORK=0TO5:PRINT"OPTION NUMBER"K+1""
462 GETOP$:IFOP$=""THEN462
464 FORM=0TO15:IFOP$=O$(M)THEN470
466 NEXTM
468 PRINT"SUBJECT NOT PRESENT:TRY AGAIN":GOTO462
470 O(K)=M:PRINTOP$:OP$(K)=OP$:NEXTK
472 P=0:GOSUB1700
474 GOSUB900:IFC=0THENPRINT"TRY AGAIN":GOTO422
476 GOSUB1000
478 NEXTNN
480 RETURN
500 PRINT"CHANGE A PUPILS' DATA"
502 GOSUB940
506 FORN=0TO25:Z(N)=255:NEXT
507 Z(26)=64
508 PRINT"PLEASE ENTER THE PUPILS':"
510 GOSUB562
516 GOSUB568
522 GOSUB586
524 FORN=0TO13:P(N)=1:NEXT
528 PRINTSN$" "CN$" "SX$(SX)
530 GOSUB900:IFC=0THENPRINT"TRY AGAIN":GOTO508
531 PRINT""
532 GOSUB1500:IFE=1THENPRINT"PUPIL NOT PRESENT:
    TRY AGAIN":GOTO508
533 PRINT""
534 GOSUB900:IFC=0THENPRINT"TRY AGAIN":GOTO508
535 GOSUB2200
```

(listing continued on next page)

(listing continued from previous page)

```
536 PRINT,"CAUTION!"
538 PRINT" THIS ENTRY HAS BEEN REMOVED FROM THE"
540 PRINT"FILE. STOPPING THE PROGRAM WILL RESULT"
542 PRINT"IN THE ERASING OF THIS ENTRY"
544 GOSUB1700
546 PRINT"WHAT DO YOU WISH TO CHANGE?"
548 PRINT"0:ABORT 1:SURNAME 2:CHRISTIAN NAME"
549 PRINT"3:FORM  4:SEX     5:SET NUMBER"
550 PRINT"6:OPTION SUBJECT"
552 GETA$:IFA$=""THEN552
554 IFA$="0"THEN640
556 A=VAL(A$):IFA>6THEN552
558 ONAGOSUB562,568,574,586,592,610
560 GOTO536
562 PRINT"SURNAME (14 LETTERS MAX)"
563 INPUTSN$:IFLEN(SN$)>14THEN562
564 SN$=SN$+"              "
565 SN$=LEFT$(SN$,14)
566 RETURN
568 PRINT"CHRISTIAN NAME (12 LETTERS MAX)"
569 INPUTCN$:IFLEN(CN$)>12THEN568
570 CN$=CN$+"            "
571 CN$=LEFT$(CN$,12)
572 RETURN
574 PRINT"ENTER FORM (H,C,S,B,L,W)"
576 GETA$:IFA$=""THEN576
578 FORSE=0TO5:IFA$=F$(SE)THEN584
580 NEXT
582 GOTO576
584 PRINTA$:F$=STR$(Y)+F$(SE):RETURN
586 PRINT"ENTER SEX (M/F)"
588 GETA$:IFA$<>"M"ANDA$<>"F"THEN588
590 SX=-(A$="F"):PRINTA$:SX$=A$:RETURN
592 FORN=1TO4:PRINT"N,SU$(N-1):NEXT
594 PRINT"INPUT SUBJECT NUMBER"
596 GETA$:A=VAL(A$):IFA<1ORA>4THEN596
598 A=A-1:PRINT""SU$(A)
602 PRINT"SUBJECT SET NUMBER (0 IN NO SET)"
606 INPUTS(A):IFS(A)<0ORS(A)>15THEN606
608 RETURN
610 PRINT"SUBJECT WITHIN AN OPTION"
612 PRINT"CHOOSE OPTION NUMBER (1-6)"
614 GETA$:A=VAL(A$):IFA<1ORA>6THEN614
616 PRINT""A:A=A-1
620 PRINT"SUBJECT WITHIN THIS OPTION"
622 PRINT"ENTER 'X' IF NO SUBJECT IS REQUIRED"
624 GETS$:IFS$=""THEN624
626 FORN=0TO15:IFS$=O$(N)THEN632
628 NEXT
630 PRINT"SUBJECT NOT PRESENT: TRY AGAIN":GOTO622
632 O(A)=N:PRINT""S$"":OP$(N)=S$:RETURN
640 FORN=0TO13:P(N)=1:NEXT
644 PRINT"":GOSUB1700
646 GOSUB900:IFC=1THEN1000
648 GOTO546
700 PRINT"DELETE A PUPIL"
702 GOSUB940
712 GOSUB562:GOSUB568
718 FORN=0TO13:P(N)=1:NEXT
720 FORN=0TO25:Z(N)=255:NEXT
722 FORN=26TO31:Z(N)=0:NEXT:PRINT""
724 GOSUB1500
728 PRINT"DO YOU WANT TO ABORT (Y/N)?"
730 GETA$:IFA$="Y"THENRETURN
732 IFA$<>"N"THEN730
734 IFE=1THEN700
736 PRINT"IS THIS THE CORRECT FILE?"
738 PRINT"D=DELETE"
740 PRINT"F=FIND ANOTHER FILE"
742 GETA$:IFA$="F"THEN700
744 IFA$<>"D"THEN742
746 GOTO2210
800 PRINT"LOAD DATA"
802 PRINT"IS THE TAPE IN THE CORRECT POSITION?"
803 PRINT"PRESS 'Y' WHEN IT IS"
804 GETA$:IFA$<>"Y"THEN804
806 SYS50130
808 X=PEEK(16320):Y=PEEK(16321)
810 X=X+1:IFX>255THENX=0:Y=Y+1
812 A=X+Y*256:POKE16320,X:POKE16321,Y
814 PRINT"FILE HAS BEEN SAVED"A"TIME";:IFA>1THENPRINT"S"
816 PRINT:A=PEEK(16128)+256*PEEK(16129)
818 X=(48896-A)/32
820 PRINT"YOU HAVE SPACE FOR"X"MORE PUPILS"
822 GOTO392
830 PRINT"SAVE DATA"
832 PRINT"IS THE TAPE IN THE CORRECT POSITION?"
833 PRINT"PRESS 'Y' WHEN IT IS"
834 GETA$:IFA$<>"Y"THEN834
836 A%=(PEEK(16128)+256*PEEK(16129)-16128)*21/1024
838 PRINT"SAVING WILL TAKE APPROX"A%"SECS"
840 SYS50120:RETURN
860 PRINT"MOVE PUPILS UP 1 YEAR,REMOVING 5TH YEAR"
868 POKE16130,0:POKE16131,64
870 SYS50078
878 FORN=0TO13:P(N)=0:NEXT
880 FORN=0TO31:POKE16384+N,255:NEXT
882 FORZ=0TO13:Z(N)=255:NEXT
884 FORN=14TO31:Z(N)=0:NEXT
886 SN$="««««««««««««««@"
888 Y=4
890 GOSUB1500:A=A+32:IFA>255THENA=0:B=B+1
892 POKE16128,A:POKE16129,B
894 RETURN
900 PRINT"IS THIS CORRECT (Y/N)"
910 GETA$:IFA$="Y"THENC=1:RETURN
920 IFA$<>"N"THEN910
930 C=0:RETURN
940 PRINT"PLEASE ENTER THE YEAR (2-5)"
942 GETA$:Y=VAL(A$):IFY<2ORY>5THEN942
944 PRINT""Y"":RETURN
950 PRINT"":V=53248
952 POKEV+32,14:POKEV+33,6
954 PRINT"THANK YOU."
956 END
997 END
998 REM*INSERT A NAME*
1000 IFY>5THENY=5
1010 IFY<2THENY=2
1020 POKE75,Y-2:SYS50148:PRINT""PEEK(75)
1030 A=PEEK(251):B=PEEK(252)
1040 POKE16130,A:POKE16131,B
1050 SYS50078
1060 I=A+B*256
1070 L=LEN(SN$):IFL<1THEN1100
1080 FORN=1TOL:M$=MID$(SN$,N,1):V=ASC(M$)
1090 POKEI+N-1,V:NEXT:IFL=13THEN1110
1100 FORN=LTO13:POKEI+N,32:NEXT
1110 L=LEN(CN$):IFL<1THEN1140
1120 FORN=1TOL:M$=MID$(CN$,N,1):V=ASC(M$)
1130 POKEI+N+13,V:NEXT:IFL=11THEN1150
1140 FORN=LTO11:POKEI+14+N,32:NEXT
1150 B(0)=(YAND7)+(SEAND7)*8+(SXAND1)*64
1160 B(1)=(S(0)AND15)+(S(1)AND15)*16
1170 B(2)=(S(2)AND15)+(S(3)AND15)*16
1180 FORN=0TO2
1190 B(N+3)=(O(N*2)AND15)+(O(N*2+1)AND15)*16
1200 NEXT
1210 FORN=0TO5:POKEI+26+N,B(N):NEXT
1220 IFI<>16160THENPOKE75,Y-2:SYS50088
1230 RETURN
1499 REM*READ 1ST FILE NAME*
1500 FORN=0TO31:POKE16224+N,Z(N):NEXT
1510 FORN=0TO31:POKE16192+N,-(Z(N)<>0):NEXT
1520 I=16160:GOSUB1070
1530 IFY>5THENY=5
1540 IFY<2THENY=2
1550 POKE75,Y-2:SYS50148:E=0:NL=0
1560 SYS50098:X=PEEK(780)
1570 A=PEEK(251):B=PEEK(252):I=A+256*B
1575 IFPEEK(I)=255THENPRINTE#:E=1:RETURN
1580 A=PEEK(251):B=PEEK(252):I=A+256*B
1599 REM*TRANSLATE*
1600 SN$="":CN$=""
1610 FORN=0TO13:X=PEEK(N+I):SN$=SN$+CHR$(X):NEXT
1620 FORN=14TO25:X=PEEK(N+I):CN$=CN$+CHR$(X):NEXT
1630 X=PEEK(I+26):SE=(X/8)AND7
1640 SX=(X/64)AND1:F$=STR$(Y)+F$(SE):SX$=SX$(SX)
1650 X=PEEK(I+27):S(0)=XAND15:S(1)=INT(X/16)
1660 X=PEEK(I+28):S(2)=XAND15:S(3)=INT(X/16)
1670 FORN=0TO2:X=PEEK(I+29+N):O(N*2)=XAND15
1680 O(N*2+1)=INT(X/16):OP$(N*2)=O$(XAND15)
1690 OP$(N*2+1)=O$(X/16):NEXT
1700 PR$=""
1710 IFP(0)=1THENPR$=PR$+SN$
1720 IFP(1)=1THENPR$=PR$+CN$
1730 IFP(2)=1THENPR$=PR$+F$
1740 IFP(3)=1THENPR$=PR$+" "+SX$
1750 FORN=0TO3
1760 IFP(4+N)=1THENPR$=PR$+STR$(S(N))
1770 NEXT
1780 FORN=0TO5
1790 IFP(8+N)=1THENPR$=PR$+OP$(N)
1800 NEXT
1810 IFPR=0THENPRINTPR$:GOTO1830
1820 PRINT#1,PR$
1830 RETURN
1999 REM*STORE BACK AFTER CHANGES*
2000 GOTO1070
2099 REM*GET NEXT NAME*
2100 POKE52224,0
2110 SYS50158:IFPEEK(52224)=255THENE=1:RETURN
2120 E=0:GOSUB1580:RETURN
2130 END
2199 REM*DELETE NAME*
2200 GOSUB1500:IFE=1THENRETURN
2210 POKE16130,A:POKE16131,B
2220 SYS50168
2230 RETURN
10000 XX=16*1024
10010 FORN=0TO31:X=PEEK(XX+N):PRINTCHR$(X);:NEXT
10020 XX=XX+32:GOTO10010
READY.
```



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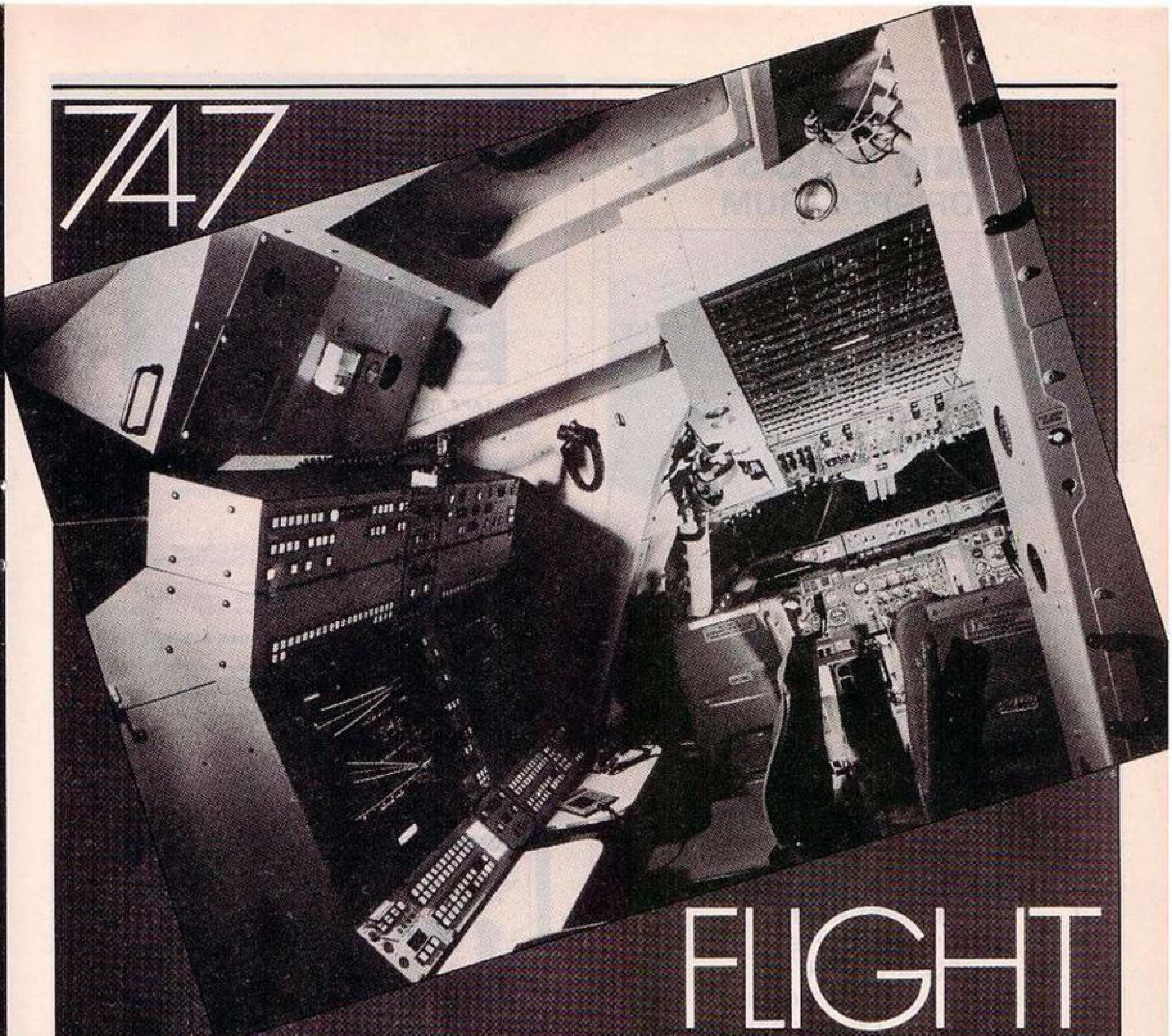
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A&F Software



747 FLIGHT SIMULATOR

David Rees reaches for a simulated sky in this simulation of a simulator.

HAVE YOU EVER WANTED to fly a 747? Now you can — almost — if you have a Commodore 64. What it lacks is detail it makes up for in safety — no hospital bills if you crash. It has no runway display, as the basic CBM-64 has no high resolution graphics commands, but it is detailed and fast enough so anyone who wants to fly by instruments can become engrossed in the program. In case you do have an extended Basic, a gap has been left in the display, and using the '64s mixed mode feature, you could put high resolution graphics here.

I have also tried to make it possible for the program to be useful for other computers by separating calculations from the display section of the program. These should be very useful, as it is very difficult to build a simulation model that will behave like the real thing, and can be treated as a core for your own flight simulator. Calculations are located at lines 2300 to 2375 and 2500 to 2999. Table 1 gives variable meanings so you can convert the program more easily.

Careful with machine code

When entering the program, be especially careful with machine-code data, and save the program before running it as one mistake could crash the computer. The code gives the simulator its speed, controlling sound effects, almost all key input, turn rate, power, elevation, attitude and sprites. These are updated twice per second, with the rest of the display being updated once per second. However, it is important to remove all Rems, as these slow the program down.

To use the simulator, you must first select two airports in order of present location to destination. A choice of nine locations is given and their data is stored at lines 6100 to 6180. You are given bearing to destination and distance, as well as wind velocity and bearing, and you are asked to choose the amount of fuel you will need. After this, you can begin to fly the simulator.

To work it, you must first know the controls and readouts of the simulator, and these are listed as follows:

Bearing: direction of desired motion — in degrees — of your aircraft, excluding wind effects.

Turn rate: rate of change of your bearing — degrees per second. Note that if you exceed the range of +2 to −2 the turn will be so sharp that turn rate will increase of its own accord. Controlled by keys + and −.

Destination bearing: direction of destination from your present position.

(continued on page 91)





VIC TAPE BACKUP
Backup Utility for VIC-20 Programs
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REWIND AND REMOVE
INSERT BACKUP TAPE
BACKUP COMPLETE



(continued from page 89)

IAS: inertial air speed, giving aircraft's total speed in knots including climb rate.

VSI: vertical speed indicator, in feet per minute.

Distance: distance to destination, in miles.

Height: altitude in feet.

Gear: status of undercarriage. Up or down — use keys U and D.

Flaps: status of flaps. None — no effect; Mid — gives extra lift; Full — slows speed dramatically. Use F key for none to mid to full, and shift F for full to mid to one.

Power: percentage power. Gives actual power being produced by the engines. Linear dial below gives optimum power — i.e., at zero feet — desired and is directly controlled by right (higher)/left (lower) cursor key.

Tips and conditions

ELL: elevation. Gives rate of change of attitude e.g. if it is positive attitude increases. Controlled by down (higher)/up (lower) cursor key.

ATT: attitude. Gives an indication of desired angle of ascent/descent.

Fuel: gives fuel remaining in tons.

Stall: during take-off this gives the speed that must be reached to start climbing in altitude. After this, it gives the speed above which the engine functions efficiently.

Time: gives flight time.

All controls mentioned above have auto repeat. One other control exists, given by key T. When pressed, all distances and bearings are changed as if 10 minutes had elapsed.

To help you start, here are some tips and conditions. When taking off, always make sure you have a high climb rate — e.g. high ATT and Flaps set to Mid — or you will crash when you leave the ground. Also, when you

(continued on page 93)

Table 1.

F	fuel
AP%	actual power input by keys.
AP	resulting actual power.
HA	maximum altitude in metres.
L	your altitude in metres.
AS	inertial airspeed (KmPH).
SL	stall speed (KmPH).
TR%	turn rate input by keys.
BE	your bearing.
FL%	flaps status: 0 = nine, 1 = mid, 2 = full.
G%	gear status 0 = up.
HH	arbitrary constant (100000).
VS	vertical speed in metres per second.
AT%	attitude.
GS	speed parallel to the ground.
XF	x position of aircraft.
YF	y position of aircraft.
WV	wind velocity.
BC	wind bearing in radians.
D	distance to destination.
XT	x position of destination.
YT	y position of destination.
DB	destination bearing.




```
1 REM*FLIGHT SIMULATOR*
2 REM* BY DAVID REES   *
4 REM*  REMOVE REMS   *
5 REM*    FOR USE     *
6 G%=1:EL%=0:FL%=0:TR%=0:P%=0:AP%=0:AT%=0
7 POKE54276,0:AS%=0:L=0
8 POKE54296,3:POKE54277,25:POKE54278,240
9 POKE54276,129:POKE54273,0
10 POKE51,0:POKE55,0
20 POKE52,60:POKE56,60
30 V=53248:POKEV+32,0:POKEV+33,0
40 POKE2040,254:POKE2041,255:POKE2042,255
50 POKEV+21,0
60 POKEV,10:POKEV+1,170
70 POKEV+2,209:POKEV+3,194
80 POKEV+4,249:POKEV+5,194
90 POKEV+39,1:POKEV+40,1:POKEV+41,1
499 REM*[CYAN][CLS]..[RIGHT]
500 PRINT"██","█FLIGHT  SIMULATOR"
509 REM*[DWN]
510 PRINT"█","BY DAVID REES (1983)"
519 REM*[DWN]
520 PRINT"█ YOU WILL PILOT A PLANE BETWEEN 2 "
530 PRINT"AIRPORTS OF YOUR CHOICE"
539 REM*[DWN]..[RVS ON]
540 PRINT"█","█NOTE"
550 PRINT"TO LAND YOU MUST BE:"
560 PRINT"1. UNDER 150 FT"
565 PRINT"2. UNDER 200 KNOTS"
570 PRINT"3. VS BELOW 300 FT/MIN"
580 PRINT"4. LESS THAN 0.4 MILES FROM THE";
585 PRINT" AIRPORT"
589 REM*[DWN*2][GREEN]
590 PRINT"███THE CHOICE OF AIRPORTS IS:"
610 FORN=16256TO19000
620 READA:IFA=-1THEN660
625 IFA=-2THEN700
630 POKEN,A
640 NEXTN
660 READA:FORK=NTOA:POKEK,0:NEXTK:N=K:GOTO640
700 FORN=0TO8:READA$(N),X%(N),Y%(N):NEXT
705 FORN=0TO8:PRINTN+1,A$(N):NEXT
709 REM*[DWN]
710 PRINT"█WHICH AIRPORT DO YOU WISH TO";
715 PRINT" FLY FROM ?"
719 REM*[DWN]
720 PRINT"█INPUT THE NUMBER.PLEASE!"
730 INPUTA$:F=VAL(A$)-1
735 IFF<0ORF>8THEN720
739 REM*[DWN]
740 PRINT"█WHICH AIRPORT DO YOU WISH TO FLY TO?"
749 REM*[DWN]
750 PRINT"█INPUT THE NUMBER.PLEASE!"
760 INPUTA$:T=VAL(A$)-1
770 IFT<0ORT>8THEN750
780 IFT=FTHEN705
799 REM*[CLS]
800 PRINT"█YOU ARE FLYING "
809 REM*[DWN]..[RVS ON]
810 PRINT"█FROM █";A$(F)
819 REM*[DWN]..[RVS ON]
820 PRINT"█TO   █";A$(T)
829 REM*[DWN]
830 PRINT"█DISTANCE IS:";
835 D=(((X%(T)-X%(F))↑2+(Y%(T)-Y%(F))↑2)↑0.5)
840 PRINTINT(D/.1609)/10;"MILES"
845 XF=X%(F):YF=Y%(F)
846 XT=X%(T):YT=Y%(T)
850 X1=X%(F):X2=X%(T)
860 Y1=Y%(F):Y2=Y%(T)
870 GOSUB 4000:DB=AN
879 REM*[DWN]..[LEFT]
880 PRINT"█BEARING :";AN;"█"
900 WV=10+INT(RND(1)*15):B=INT(RND(1)*360)
909 REM*[DWN]
910 PRINT"█WIND VELOCITY :";INT(WV/1.7);"KNOTS"
919 REM*[DWN]..[LEFT]
920 PRINT"█BEARING";B;"█"
949 REM*[DWN]
950 PRINT"█HOW MUCH FUEL (22-90 TONS)?"
960 INPUT F:IFF<22 OR F>90 THEN 960
970 F=INT(F*10)/10
979 REM*[DWN]
980 PRINT"█TAKE OFF WEIGHT IS :";220+F;"TONS"
989 REM*[DWN][RVS ON]
990 PRINT"██PRESS ANY KEY TO START"
995 GETA$:IFA$=""THEN995
999 REM*[CLS]
1000 PRINT"█BEARING",,"TURN RATE"
1009 REM*[DWN]
1010 PRINT"█DESTINATION BEARING"
1049 REM*[DWN*5]
1050 PRINT"█████IAS:",,"VSI:"
1060 PRINT"DISTANCE:",,"HEIGHT:"
1069 REM*[PURPLE]
1070 PRINT"█┌─────────┬─────────┐"
1080 PRINT"|GEAR:DOWN|FLAPS:NONE|"
1090 PRINT"└─────────┴─────────┘"
1099 REM*[DWN][GREEN]
1100 PRINT"██POWER (%):"
1109 REM*[PURPLE]
1110 PRINT"█──────────"
1120 PRINT"└──────────┘"
1129 REM*[GREEN]
1130 PRINT"██    50    100"
1140 PRINT"FEUL:"
1159 REM*[UP*9]
1160 PRINT"██████████"
1169 REM*[LEFT*3]
1170 FORN=0TO10:READA$:PRINT,,"███";A$:NEXT
1189 REM*[HOME][CYAN]
1190 PRINT"█"
1300 POKEV+21,255
1900 BE=90:SL=272:BC=B*π/180
1910 TI$="000000":HH=100000
1920 C1=16384:C2=16670:C3=16801:HA=30000
2000 FF%=FL%:GG%=G%:SYSC1:SYSC2:SYSC3
2029 REM*[HOME][DWN].[LEFT]..[LEFT]
2030 PRINT"██";BE;"█  ",,TR%/10;"█  "
2039 REM*..[LEFT]
2040 PRINT,,DB;"█  "
2049 REM*[DWN*5][RIGHT*4]..[LEFT]
2050 PRINT"███████████";INT(AS/1.7);"█ "
2054 REM*[UP]..[LEFT]
2055 PRINT"█";TAB(24);INT(VS*3.28);"█ "
2059 REM*..[LEFT]
2060 PRINTTAB(5);INT(D/0.16093)/10"█  "
2061 REM*[UP]..[LEFT]
2062 PRINT"█";TAB(27);INT(L*3.28);"█ "
2119 REM*[DWN*4]..[LEFT]
2120 PRINT"█████",INT(AP);"█ "
2129 REM*[DWN*3][RIGHT*5]..[LEFT]
2130 PRINT"██████████";INT(F*10)/10;"█ "
2139 REM*..[LEFT]
2140 PRINT"STALL :";INT(SL/1.7);"█ "
2150 IFL=0ANDTA=0THENTI$="000000"
2155 IFL<>0THENTA=1
2159 REM*[DWN]
2160 PRINT"█TIME :"TI$
2300 F=F-AP%/60000:IFF<=0THENF=0:P%=0
2310 AP=AP%*(HA-L)/60000
2315 IFAS<SLANDL>0THENAP=AP*(AS/SL)
2320 TR%=TR%-TR%/20-(TR%<0)
2330 BE=BE-TR%*(L>0)/10:IFBE>=360THENBE=BE-360
2340 IFBE<0THENBE=BE+360
2350 SL=272*(HA+L)/HA
2360 AS=AS-((1-(FL%=2)-(G%=1))*AS/10)*(HH-L)/HH
2365 AS=AS+AP*1.2-EL/100-VS/1000
2370 AS=AS+(AS<SL)*(L>0)/10+SIN(AT%/162.[illegible])
2375 AS=AS-(220+F)/10000-TR/10-ABS(TR%)
2459 REM*[HOME][DWN*8]
2460 PRINT"████████████"
2465 SYSC1:SYSC2:SYSC3:IFL=0ANDG%=0THENG%=1
2466 PRINT:IFG%=GG%THEN2485
2469 REM*..[RIGHT*8].[UP]
2470 IFG%=0THENPRINT"████████UP   █":GOTO2489
2479 REM*..[RIGHT*8].[UP]
2480 PRINT"████████DOWN"
```

(listing continued on page 93)

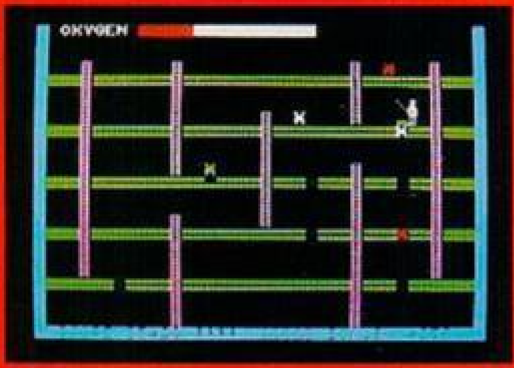
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SHARP MZ-700 SERIES



FROGGER — £6.95

This most popular of arcade games has been totally recreated for the Sharp computer. Superb graphics and as fast as you like from beginner's level up to 'Super-human'. Get each of four frogs over the busy motorway, then hop from boat to raft to log to crocodile until safely home sitting on a lily pad. Terrific fun.



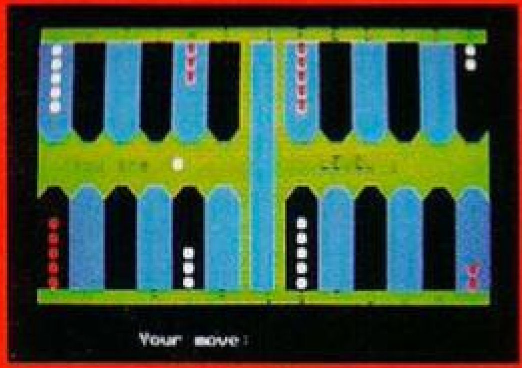
SPACE PANIC — £7.95

How long can you survive in the multi-storey building filled with alien bugs. This machine-code programme accurately simulates the arcade game where you climb ladders and dig holes to catch the aliens then fill them in again once they are caught. The red ones must fall through one floor, the green ones, two floors and white ones, three floors. Red aliens who have time to dig themselves out get rather cross and become green. PANIC!! Joy stick or keyboard control.



GALAXIANS — £7.95

A high-speed machine-code version of the popular arcade game where the massed space invaders must be cleared from the skies. After a few seconds they will begin to swoop and dive at you, showering you with scatter bombs as they go. The game becomes progressively more demanding as you kill more and more of the marauding aliens. Very entertaining — hours of fun!!! Joy stick or keyboard control.



BACKGAMMON — £7.95

Now available for the MZ-700, this traditional board game can now be played against the computer. Simple to follow instructions for the beginner — higher levels available for the more experienced player.



NIGHTMARE PARK — £6.95

If you have never played this type of game before, you're in for a treat. As you make your way along the intricate pathways to the exit, you are constantly given tasks to perform or games to play. Each of these must be successfully completed before you are allowed to continue. It takes a lot of doing. You must remain quick and alert at all times. A little luck is handy. Amazing graphics and sounds!!!



FIGHTER COMMAND — £6.95

A mission flown completely on instruments where you are pursuing a fleet of ten enemy aircraft fleeing from you. They will show on your long range radar screen and you must manoeuvre your craft to get them within range of your missiles. If you get too near, they will fire at you and warp away to safety. You only have one chance to destroy incoming missiles with your lasers.



CHESS — £9.95

Suitable for the rank beginner through to the more experienced player, this Chess program may be used in three different ways.

1. As a referee between two players, checking for valid moves, CHECK and CHECKMATE situations.
2. As an opponent with 14 levels of intelligence to match your skills.
3. As a teaching aid when asked to play against itself or show you the best move if you get into difficulties.

Long games may be saved on cassette for completion at a later time and a print-out of all moves made is available.



XANAGRAMS — £9.95

Not only a terrific spelling test but also a great game. You are asked to guess up to five words, represented by blocks on the screen in a crossword format. All the letters that you need are shown on the right of the screen in alphabetical order and the computer will give you the first letter if you ask it nicely. Suits almost any age with 3 skill levels and from 1 to 5 words to be guessed. Really habit-forming!!!



LIGHTNING PATROL — £3.95

Choose your rank in the RAF and you are immediately sent on a mission to catch and shoot down ten enemy Mirage jets that are fleeing after their attack on your airbase. You must manoeuvre your plane to get them in your gun-sights whilst they are weaving about the sky to avoid being hit. Limited ammunition and fuel available so efficiency and accuracy are all important to your completion of the mission. Promotion for the successful but poor performances can mean you are asked to leave the airforce. Joy stick or keyboard control.

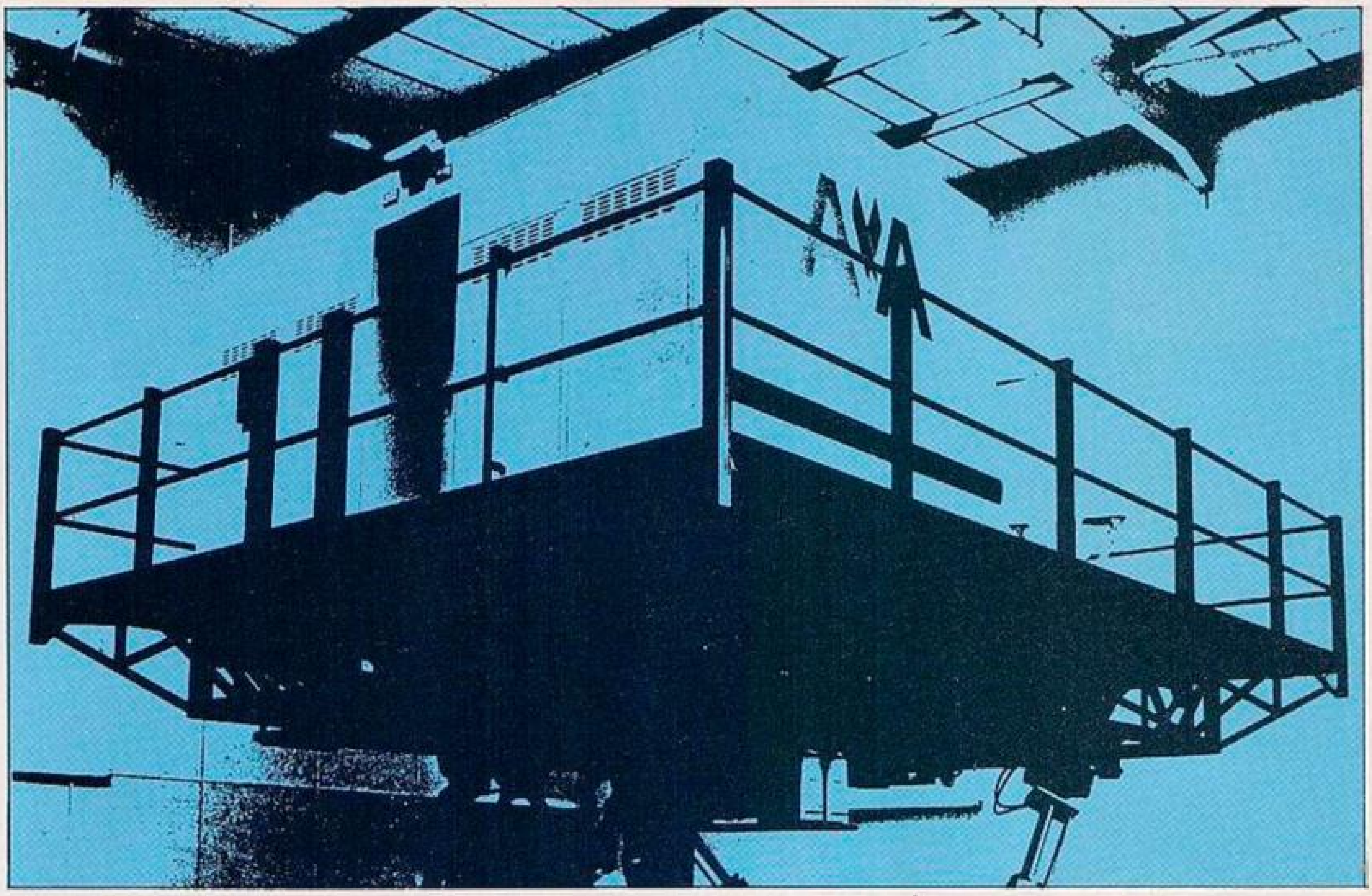
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VISA



(continued from page 91)

are flying, do not let your speed exceed 650 knots, as your wings may be ripped off!

To land, certain conditions must be observed. As there is no high resolution display, runway direction is discounted. Instead, when you are less than 0.4 miles from the runway centre and less than 160 feet above it, it measures the following features: gear, which must be down; IAS, which must be less than 290 knots; and vertical speed, which must be less than 328 feet per minute. Details given in the program are for an acceptable landing, limits here being for anything short of a crash.

When you have landed, you are given the time it took you to complete the journey, so that you can repeat the trip to try for a record time. Finally, all Print control characters have been Remed in case they do not reproduce clearly.

(listing continued from page 91)

```
2485 IFFLX=FFXTHENPRINT:GOTO2500
2489 PRINTTAB(17);
2490 IFFLX=0THENPRINT"NONE":GOTO2500
2494 IFFLX=1THENPRINT"MID ":GOTO2500
2497 PRINT"FULL"
2500 VS=AS*(-(FLX+1)/10+SIN((-ATX)/162.8))
2505 VS=VS*2+(L)0)*80*(1-3*(AS(80))+VS/1.3
2510 IF AS<SL AND L=0 THEN VS=0
2520 L=L+VS/60:IFL<0THEN10000
2525 GS=COS(-ATX/162.8)*AS
2530 XF=XF+(GS*SIN(BE*π/180)+WV*SIN(BC))/3600
2540 YF=YF+(GS*COS(BE*π/180)+WV*COS(BC))/3600
2550 D=((XT-XF)↑2+(YT-YF)↑2)↑0.5
2560 BE=INT(BE*10)/10
2590 IF D<0.6 AND L<50 THEN 3000
2600 X1=XF:X2=XT:Y1=YF:Y2=YT
2610 GOSUB4000:DB=INT(AN*10)/10
2640 IF AS>1105 THEN 11000
2650 GETA$:IFA$="T"THEN3700
2999 GOTO2000
3000 IF AS<500 AND ABS(VS)<100THEN 3020
3010 GOTO10000
3020 IF GX=1 THEN 3040
3030 GOTO10000
3040 FORN=0TO999:NEXT
3050 POKE54296,0:POKEV+21,0
3059 REM*[CLS][RVS ON][GREEN]
3060 PRINT"■■WELL DONE!"
3070 PRINT"YOU LANDED AFTER "MID$(TI$,1,2);
3075 PRINT" HOURS,"MID$(TI$,3,2)" MINS AND "
3080 PRINTMID$(TI$,5,2)" SECONDS"
3090 PRINT"OF FLIGHT"
3600 END
3700 A$=TI$:B$=MID$(A$,3,1):C$=MID$(A$,1,2)
3710 B=VAL(B$)+1:IFB>5THENB=0:GOSUB3900
3720 B$=STR$(B)
3725 TI$=C$+MID$(B$,2,1)+MID$(A$,4,3)
3730 F=F-APX/100
3740 L=L+VS*10
3750 XF=XF+(GS*SIN(BE*π/180)+WV*SIN(BC))/6
3760 YF=YF+(GS*COS(BE*π/180)+WV*COS(BC))/6
3770 GOTO2300
3899 END
3900 C$=MID$(A$,2,1):C=VAL(C$)+1
3910 D$=STR$(C)
3920 C$=MID$(A$,1,1)+MID$(D$,2,1)
3930 RETURN
3999 REM* ANGLE *
4000 DX=X2-X1:DY=Y2-Y1
4010 SG=-(DX<0)-(DY<0)*2
4020 IF DX=0 THEN AN=90:GOTO4050
4030 Z=ABS(DY/DX)
4040 AN=90-ATN(Z)*180/π
4050 IF SG=2 THEN AN=180-AN
4060 IF SG=3 THEN AN=180+AN
4070 IF SG=1 THEN AN=360-AN
4080 AN=INT(AN*10)/10
4090 RETURN
5000 DATA3,,,3,,,3,,,3,,,3,,,3,,,3,,,3,-1,16318
5010 DATA255,-1,16382
5100 DATA160,31,177,45,201,255,208,4
5110 DATA169,,145,45,201,102,208,4
5120 DATA169,100,145,45,177,45,133,251
5130 DATA160,30,177,45,24,74,24
5135 DATA197,251,240,24,56,229,251
5140 DATA176,11,177,45,24,105,1,24
5150 DATA145,45,24,144,8,177,45,56
5160 DATA233,1,24,145,45
5200 DATA165,197,201,30,208,7,160,3
5210 DATA169,,145,45,96,201,18,208,7
5220 DATA160,3,169,1,145,45,96,201,2
5230 DATA208,44,160,31,173,141,2,41,1
5240 DATA201,,240,8,177,45,56,233,2,24
5250 DATA144,6,177,45,24,105,2,24
5260 DATA145,45,24,105,10 ,24,141,,208
5270 DATA56,233,15 ,24,74,24,141,1,212
5280 DATA96
5300 DATA165,197,201,7,208,49,160,10
5310 DATA173,141,2,41,1,201,0,240,19
5320 DATA177,45,24,105,1,24,145,45
5330 DATA201,,240,1,96,136,169,,145,45
5340 DATA96
5350 DATA177,45,56,233,1,24,145,45
5360 DATA201,255,240,1,96,136,169,255
5370 DATA145,45,96
5400 DATA201,21,208,41,160,17,173,141,2
5410 DATA41,1,201,1,240,15,177,45,24
5420 DATA105,1,24,201,3,208,2,169,2
5430 DATA145,45,96,177,45,56,233,1,24
5440 DATA201,255,208,2,169,,145,45
5450 DATA96
5460 DATA160,24,201,40,208,26,177,45,24
5470 DATA105,1,24,145,45,201,128
5480 DATA208,5,169,127,145,45,96
5490 DATA201,,240,1,96,136,145,45
5500 DATA96
5510 DATA201,43,240,1,96,177,45,56
5520 DATA233,1,24,145,45,201,128,208,5
5530 DATA169,128,145,45,96,201,255
5540 DATA240,1,96,136,145,45
5550 DATA96
5590 REM
5600 DATA160,10,177,45,41,96,201,32
5610 DATA208,4,169,31,145,45,201,64
5620 DATA208,4,169,224,145,45,177,45
5630 DATA133,251,160,45,41,224,201,224
5640 DATA208,28,169,255,56,229,251
5645 DATA24,133,251,177,45,56,229,251
5650 DATA176,8,176,136,169,255,145,45
5660 DATA138,200,24,145,45,24,144,18
5670 DATA177,45,24,101,251,144,9,24,176
5680 DATA136,169,,145,45,138,200,145,45
5690 DATA160,31,177,45,201,254,208,4
5700 DATA169,,145,45,160,10,177,45,24
5710 DATA105,194,24,141,3,208,160,45
5720 DATA177,45,24,105,128,24,74,24,74
5730 DATA24,105,162,24,141,5,208,96
5790 DATA160,44,177,45,201,255,240,15
5800 DATA208,177,45,56,233,127,176,1,96
5810 DATA24,169,128,145,45,96,208,177,45
5820 DATA24,105,127,144,2,24,96,169,128
5830 DATA145,45,96
5930 DATA96
6000 DATA-2
6100 DATA"NEW YORK",-5504,-1020
6110 DATA"GLASGOW",39,635.5
6120 DATA"EDINBURGH",104,665
6130 DATA"MANCHESTER",183,375
6140 DATA"BIRMINGHAM",221,279
6150 DATA"HEATHROW",319,164
6160 DATA"GATWICK",342,125.5
6170 DATA"STANSTED",358,200
6180 DATA"ORLY (PARIS)",520,-183
6999 REM*[GREEN]
7000 DATA"■E    A","L    T","L    T"
7009 REM*[LEFT*2].[PURPLE].[GREEN].[PURPLE]
7010 DATA"■■2■┐ ■2■┐"
7020 DATA"||    ||","||    ||"
7029 REM*[LEFT][GREEN].[PURPLE].[GREEN].[PURPLE]
7030 DATA"■■■■|   ■■■|"
7039 REM*[LEFT]
7040 DATA"■┐|   ┐|"
7050 DATA"||    ||","||    ||"
7058 REM*[LEFT*3][GREEN].[PURPLE].[GREEN].
7059 REM*[PURPLE]
7060 DATA"■■■■-32■|■-32■|"
9999 REM*[CLS]
10000 PRINT"■CRASH"
10020 POKE54296,0:POKEV+21,0
10040 FORN=0TO999:NEXT
10050 PRINT"YOUR WREAKAGE IS SPREAD OVER"
10060 PRINTAS*100/ABS(VS)
10070 PRINT"YARDS"
10080 END
10999 REM*[CLS]
11000 PRINT"■ YOUR WINGS HAVE BEEN RIPPED OFF!"
11100 POKEV+21,0
READY.
```


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VIC

Peter Bartley takes to the air in a duel to the death for two players.



Frank B. Mormillo

Program 1.

```
10 POKE36878,15:POKE56,26:POKE52,28:POKE51,0:POKE55,0:FORA=1TO30:READB,C:NEXT
20 POKE36879,8:PRINT"[redacted]HARACTER LOADING      [redacted]-¬N "ROGRESS"
30 FORA=6856TO6786:READB:POKEA,B:NEXT:FORA=7176TO7351:READB:POKEA,B:NEXT
40 FORA=0TO7:POKE7424+A,0:POKE7168+A,0:NEXT:FORA=7552TO7631:READB:POKEA,B:NEXT:R
ESTORE
50 POKE36879,204:POKE7175,255:POKE36869,255:B$="[redacted] A [redacted] A A [redacted] A
[redacted] "
60 PRINT"[redacted]HIT ANY KEY TO LOAD[redacted]"
70 FORA=1TO30:READB,C:POKE36876,B:FORD=1TOC*100:NEXT:POKE36876,0:GETA$
75 IFA$=""ANDA<30THENNEXT
80 IFA$<>""THENPRINT"J":POKE36869,240:GOTO300
85 FORA=18TO2STEP-1:PRINT"[redacted]"TAB(A)B$:POKE36874,130+A:NEXT:RESTORE
90 POKE36874,0:GOTO60
95 REM***TUNE DATA****
100 DATA 225,4,232,2,225,2,225,2,221,1,219,1,221,2,225,2
110 DATA 219,4,220,2,219,2,218,2,215,1,209,1,207,2,215,2,209,2,215,2,218,2,220,2
,225,4
120 DATA 218,1,225,4,215,4,228,1,231,1,232,2,231,4,228,1,225,4
130 REM**M/CODE DATA**
140 DATA169,127,141,34,145,173,32,145,41,128,141,240,29,169,255,141,34,145,173,3
1,145,41
150 DATA 8,141,241,29,173,31,145,41,16,141,242,29,173,31,145,41,4,141,243,29,173
,31,145
160 DATA 41,32,141,244,29,96
170 REM***CHAR DATA***
180 DATA 0,125,41,191,255,190,40,124,16,104,116,56,93,47,23,2
190 DATA 8,0,127,127,62,8,20,8,8,22,46,29,186,244,232,64,0,190,148,253,255,125,2
0,62
200 DATA 64,208,208,116,186,92,44,16,0,28,8,62,127,127,8,8,2,11,19,46,93,58,52,8
210 DATA 56,124,68,40,16,56,16,40,0,0,0,0,16,16,0,0,255,17,238,170,238,17,255,0,
232,168
220 DATA 236,140,204,206,0,255,229,165,247,179,179,179,0,255,119,69,119,102,102,
118,0
230 DATA255,8,40,172,140,172,172,0,255,14,42,162,142,172,174,0,255,16,16,32,32,3
2,64,64
240 DATA32,145,18,52,248,29,46,8,137,8,65,0,28,8,106,28,137
250 DATA7,2,2,3,3,3,0,255,79,74,106,106,106,106,0,255,156,145,221,216,217,221,0,
255
260 DATA15,9,13,13,13,15,0,255
270 DATA2,2,3,3,3,3,0,255,15,1,15,12,13,15,0,255,15,1,15,3,3,15,0,255,8,8,14,15,
6,6,0
280 DATA255,15,8,15,3,11,15,0,255,12,8,15,13,13,15,0,255,15,1,3,3,3,3,0,255,7,5,
15,9,9
290 DATA15,0,255,15,9,15,3,3,3,0,255
300 POKE198,7:POKE631,76:POKE632,207:POKE633,13:POKE634,82:POKE635,213:POKE636,13
```

JUST FOR A CHANGE, here is a two-player game for the unexpanded Vic-20, based on that arcade veteran, Dogfight. You'll need a joystick but that is all.

The objects of the game are to stay alive and make points by shooting the other player down or by causing him to crash. There are four ways of losing a life.

- Hitting the runway — usually caused by attempting to take off downwards, or coming out of a dive too late.
- Flying too high and stalling your engine — in effect, hitting the time/scores display.
- Being shot.
- Collision with the other player.

When the time reaches 1 minute 30 seconds the game ends and a new game can be started by hitting any key. Player one operates the keyboard and the red plane, while player two has the joystick and the blue plane. The keys used are: O, up; comma, down; K and L, left and right.

Movement of the planes is fairly easy to master. Simply move the joystick/hit the key in the direction you want to go and keep it pushed/depressed until you have reached the desired position — your plane will turn, but not on the spot. Taking your finger off the key/releasing the joystick will stop the turn and keep you going in the current direction.

The only difficulty lies in changing direction to the opposite of what it was — reversing is a close approximation to this definition — going from a right-left direction

(continued on page 99)

Program 2.

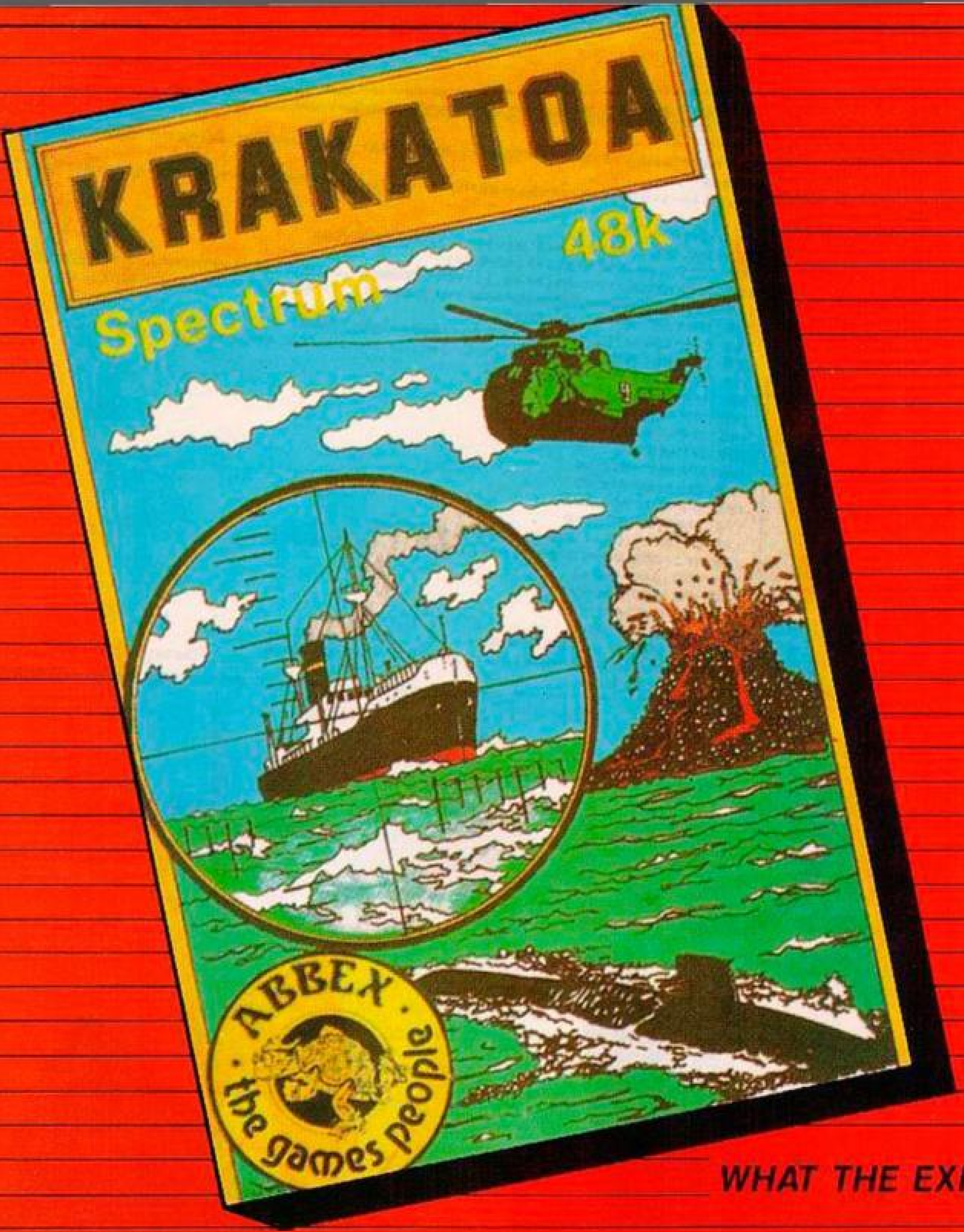
```
80 V=36879:W=V-4:X=W+1:POKEV+1,238:POKEV-9,255:POKEV,15:PRINT"[redacted]TUV8888L[redacted]D888L
MNP888"
85 A(1)=-1:A(2)=-23:A(3)=-22:A(4)=-21:A(5)=1:A(6)=23:A(7)=22:A(8)=21:TI$="000000
"
90 A=3:S1=-1:S2=-1
95 POKEJ,32:J=8162:H=1:S1=S1+1:IFA<>3THEN105
100 POKEK,32:K=8143:I=5:S2=S2+1
105 FORA=0TO21:POKE8164+A,11:POKE38884+A,8:NEXT:IFS1>9THENPRINT"[redacted]1"
110 PRINT"[redacted]"RIGHT$(STR$(S1),1)"[redacted]"RIGHT$(STR$(S2),1)
115 IFS2>9THENPRINT"[redacted]1"
120 SYS6656:P=PEEK(7664)+PEEK(7665)+PEEK(7666)+PEEK(7667)
125 IFPEEK(7668)=0ANDL=0THENL=J+A(H):M=A(H):Z=L+M*5:POKEV-1,200
130 IFP=156THENE=H:GOTO175
135 IFP=140THENE=1
140 IFP=136THENE=2
145 IFP=152THENE=3
150 IFP=24THENE=4
155 IFP=28THENE=5
160 IFP=20THENE=6
165 IFP=148THENE=7
170 IFP=132THENE=8
175 C=PEEK(197):IFC=64THEND=1:GOTO205
180 IFC=20ANDN=0THENN=K+A(I):O=A(I):Y=N+O*5:POKEV-1,200
185 IFC=44THEND=1
190 IFC=52THEND=3
195 IFC=29THEND=7
200 IFC=21THEND=5
205 IFH<EANDE-H<=4THENH=H+1
210 IFH<EANDE-H>4THENH=H-1:IFH=0THENH=8:GOTO220
215 IFH>EANDH-E<=4THENH=H-1
```

(listing continued on page 99)

DOGFIGHT



Frank B. Mormillo



£5.95

WHAT THE EXPERTS SAY

Its wealth of detail is amazing. One of the busiest games for a long time. The graphics are really excellent, well drawn and animated. A complicated, demanding game which I can't see losing its appeal for a long time. Krakatoa is both addictive and hard to play. It takes ages to get any good and the scope for getting better scores each time is enormous — very good, highly recommended. Game of the month.
"Crash Micro"

An amazing piece of programming, a great program. A year ago we would not have believed it was possible to do this.
"Software Supermarket



The only review said "Speech is effective and must be at the limit of spectrum capabilities, graphics are excellent and animation superb. A combination of graphics, adventure maze and chase games makes this an unusual, fascinating and addictive program which must rank among the spectrum classics.

Value for money	100%
Graphics	100%
Overall score	100%

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(continued from page 96)

to a left-right one. Pushing the stick in the opposite direction will cause the plane to move in this direction, but it will always turn in the same direction. This is unless you specify that you want to turn in another direction by pushing the stick in that direction and then in the actual direction you want to be going in. So, if you want the plane to turn downwards, you would push the stick down first, and then hard right.

The bullets have a range of six plane lengths after which they become ineffective. It is impossible to shoot the other player if his plane is directly in front of you — in an adjacent character space.

Arcade freaks may remember that the original game Dogfight had the screen edged with flak. Partly due to screen size, and partly to do with speed — although the method of Poking directly to character memory is very quick — the flak has been omitted from this version. Hence full-screen wraparound operates — you can leave the screen on one side and come back on the other side. But beware — so do the bullets!

The program is in two parts. Program 1 defines the characters, sets up a machine-code routine to read the joystick and produces a title screen — animated — with music.

The Print statement in line 80 must be typed in exactly as listed to produce the correct display.

Lines 95 and 100 may seem to be in an odd position, but they come into their own in conjunction with the On-Goto statement in line 360. This saves repeated definition of the plane positions both at the start of a game and after a crash/collision.

The trouble with two-player games like this is the need to repeat the control sequences which use up a lot of the Vic's already short memory. Conceivably the game could be enhanced if memory expansion is a

(listing continued from page 97)

```
220 IFH>EANDH-E>4THENH=H+1:IFH=9THENH=1
225 IFI<DANDD-I<=4THENI=I+1
230 IFI<DANDD-I>4THENI=I-1:IFI=0THENI=8:GOTO240
235 IFI>DANDI-D<=4THENI=I-1
240 IFI>DANDI-D>4THENI=I+1:IFI=9THENI=1
245 IFL>0ORN>0THENPOKEV-1,0
250 F=PEEK(L+M):IFL>0ANDL<>ZANDF=32THENPOKEL,32:L=L+M:POKEL+30720,0:POKEL,18:GOT
O250
255 POKEL,32:L=0:M=0
260 IFF>0ANDF<9THEN300
265 B=PEEK(N+O):IFN>0ANDN<>YANDB=32THENPOKEN,32:N=N+O:POKEN+30720,0:POKEN,18:GOT
O265
270 POKEN,32:N=0:O=0
275 IFB>0ANDB<9ORK+A(I)<7702ORK+A(I)>8163ORJ+A(H)<7702ORJ+A(H)>8163THEN300
280 POKEK,32:POKEJ,32:K=K+A(I):J=J+A(H):POKEK+30720,2:POKEK,I:POKEJ+30720,6
285 POKEJ,H:IFJ=KTHEN300
290 POKEW,133+H:POKEX,127+I:IFTI$>="000131"THENPOKE198,0:POKEV,0:GOTO365
295 PRINT"█████"RIGHT$(TI$,3):GOTO120
300 T=150:POKEV+1,234:T$=TI$:IFJ+A(H)>8163THENPOKEJ,19:POKEJ+30720,0:A=1:GOTO355
305 IFK+A(I)>8163THENPOKEK,19:POKEK+30720,0:A=2:GOTO355
310 IFF>0ANDF<9ORK+A(I)<7702THENB=K:A=2
315 IFB>0ANDB<9ORJ+A(H)<7702THENB=J:A=1
320 IFJ=KTHENB=J:A=3
325 POKEW,0:POKEX,0:POKEB,18:Q=B:FORR=250TO180STEP-1:POKEB+30720,RND(1)*14:POKEV
-1,R
330 NEXT:POKEV-1,0
335 POKEB+30720,0:POKEB,17:POKEW,T:B=B+22:T=T+1:IFPEEK(B)=1THEN345
340 POKEB,7:POKEB+30720,RND(1)*5+2:FORS=1TO50:NEXT:GOTO335
345 POKEW,0:FORS=QTOB-22STEP22:POKES,32:NEXT:POKEB-22,19:POKEV-1,155:FORS=QTOB-2
2STEP22
350 POKES,9:FORU=1TO100:NEXT:G1=RND(1)*4-2:POKEV-13,38+G1:POKE38600+B,2+G1:POKES
,32:NEXT
355 POKEV-1,180:FORS=15TO0STEP-.04:POKEV,S:NEXT:POKEV-1,0:POKEV,15:POKEV-13,38
360 POKEV+1,230:TI$=T$:ONAGOTO85,100,85
365 PRINT"████████████████ ─────── ███████████████|GAME OVER|███████████ ───
──"
370 FORA=1TO1000:NEXT:POKE198,0
375 GETA$:IFA$<>""THENRUN
380 GOTO375
READY.
```

GET TO GRIPS WITH ARCADE ACTION!

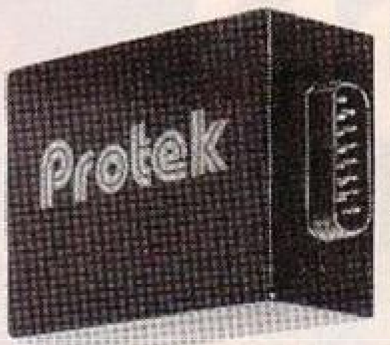




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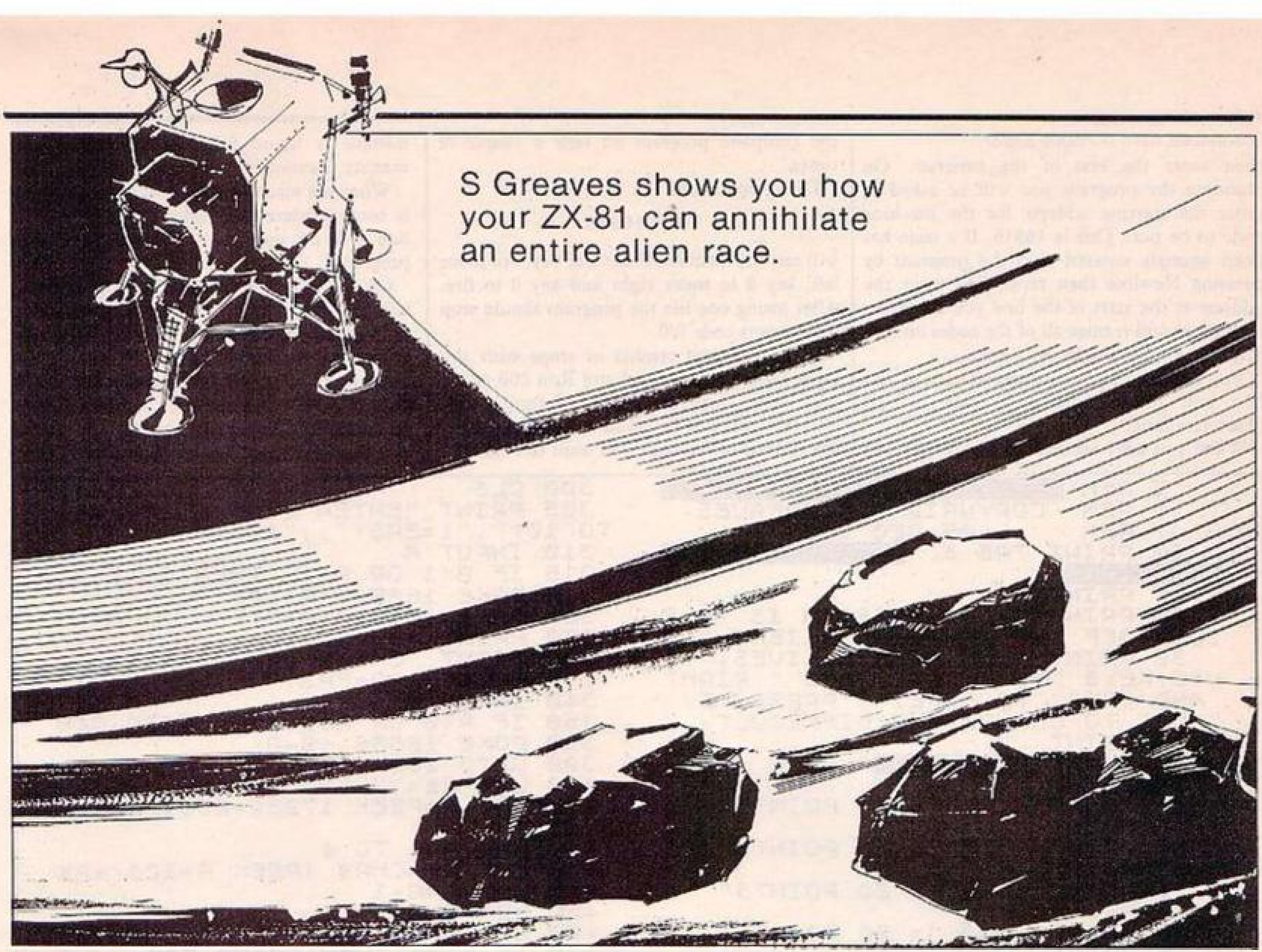
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Hex loader.

```
 99 REM ***HEX LOADER***
100 CLS
130 PRINT "START ADDRESS"
140 INPUT S
150 PRINT "FINISH ADDRESS"
160 INPUT F
180 FOR N=S TO F STEP 8
190 LET T=0
200 PRINT N;" - ";
210 INPUT A$
220 PRINT A$;" = ";
230 INPUT TOT
240 PRINT TOT
245 LET Z=0
250 FOR K=1 TO LEN A$ STEP 2
260 LET C=(CODE A$(K)-28)*16+CO
 DE A$(K+1)-28
270 LET T=T+C
280 POKE N+Z,C
290 LET Z=Z+1
300 NEXT K
310 IF TOT=T THEN GOTO 340
320 PRINT "ERROR - PLEASE INPUT
AGAIN"
330 GOTO 190
340 NEXT N
350 STOP
```

GALAXOIGS

FED UP WITH the annihilation of their main battle fleet the Galaxians have returned, this time with a completely revised battle strategy. Instead of trying to invade our planet in an orderly formation and being blasted out of existence the main fleet hovers just out of range of your gun. But, waves of fighters are sent in to try and soften up the opposition.

Your task is to destroy as many of the aliens as you can. You score 10 for hitting stationary starships and 20 for each moving fighter. As you progress the number of fighters in the battle area will increase thus making stronger waves of attack and life more hazardous for you as the defender. You will have to dodge bombs and decide your priorities as you play the game.

Now for the boring part of the whole thing, entering the machine code for the program.

First make a Rem statement line 1 of 100 characters and edit it seven times to make lines 1 to 8 each of 100 characters. Then add line 9 Rem followed by another 34 characters. To check that all is correct type in as a direct command:

PRINT (PEEK 16396 + 256 × PEEK 16397), NEWLINE

If everything is correct you should be rewarded by the number 17397 appearing in the top left corner of your screen. If not check and adjust your Rem statements accordingly.

When all is well enter the following as direct commands:

```
POKE 16511,116     N/L
POKE 16512,3       N/L
POKE 16510,0       N/L
POKE 16514,118     N/L
POKE 16515,118     N/L
```

You should now have a Rem line 0 with nothing after it.

If all is well enter the hex loader and reader. You will find that the computer will keep listing line 0 so after entering line 10 as direct commands:

```
LIST 10            N/L
POKE 16419,10      N/L
```

(continued on next page)

(continued from previous page)

then enter the rest of the program. On Running the program you will be asked to enter the starting address for the machine code to be put. This is 16516. If a code has been wrongly entered stop the program by pressing Newline then rerun and enter the address at the start of the line you made the mistake in and reenter all of the codes on that line.

You can enter as many codes at once as you like but, please note each code is two characters long.

When you have entered all the codes, save the complete program on tape a couple of times.

Direct command

USR 16549

will test the machine code. Use key 5 to move left, key 8 to move right and key 0 to fire. After losing one life the program should stop with report code 0/0.

If the program crashes or stops with any other report code, reload and Run 200 of the hex loader program. When Running this program you will be asked to enter the starting address of the code you want to read. If a mistake is found you can correct it in a manner previously discribed.

When the machine code part of the program is correct delete the loader program line by line — do not use new — then enter the Basic program.

On Running the completed program you will be offered the opportunity of changing both speed and difficulty. This is set initially at five and five by the listing.

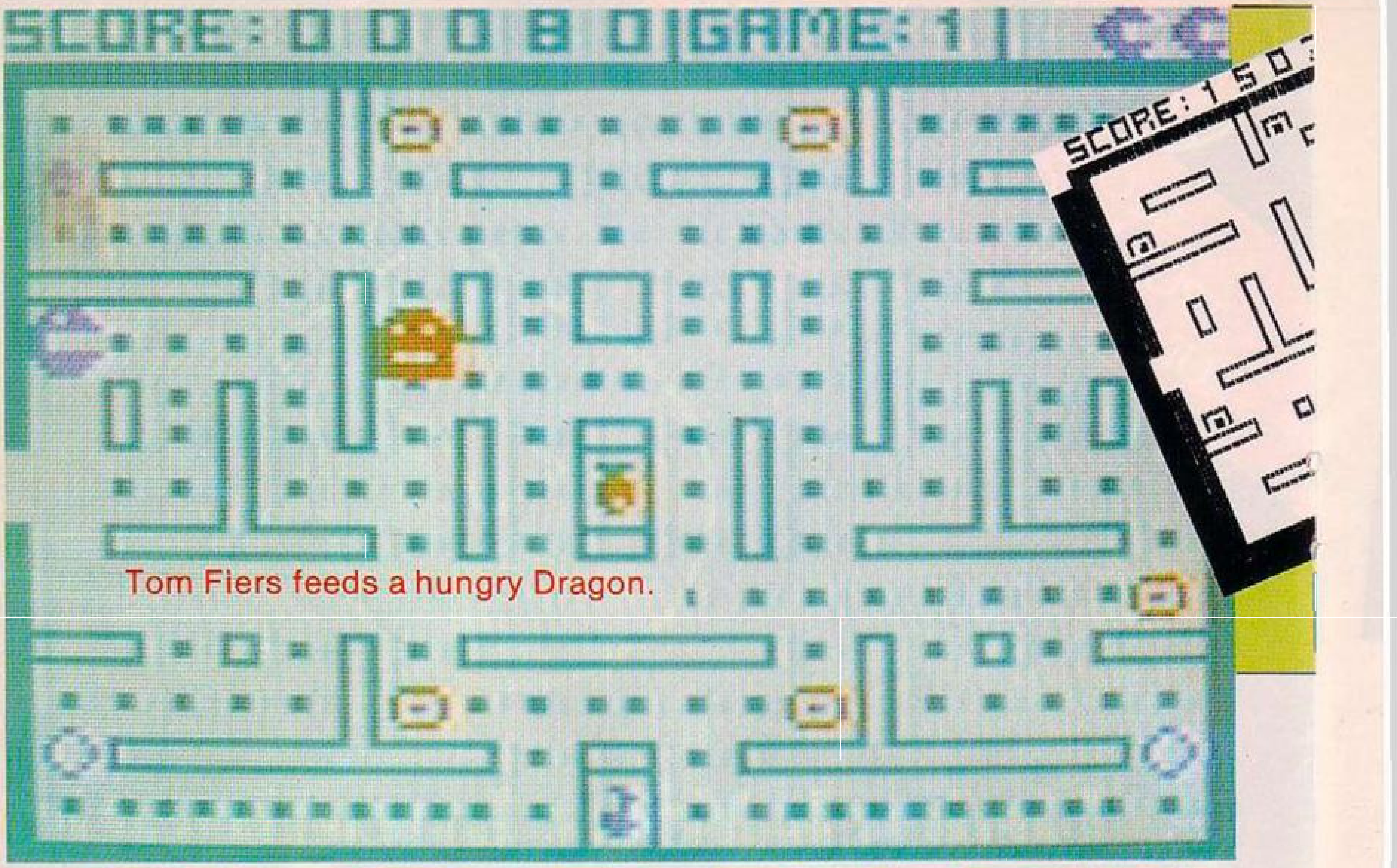
Anybody with suicidal tendencies might like to try entering the highest choices available. Whichever combination you choose you will have three lives to lose so good luck.

```
  5 REM RETURN OF THE GALAXIANS
  6 REM  COPYWRIGHT S.GREAVES
  7 REM      25 DEC 1983
 10 PRINT TAB 4;"RETURN OF THE GALAXIANS"
 15 PRINT
 20 PRINT "YOUR MISSION IS TO FIGHT OFF THE INVADING ALIENS.",,
 30 PRINT "YOU HAVE 3 LIVES.",,"USE KEYS ""5"" LEFT, ""8"" RIGHT AND ""0"" TO FIRE.","PRESS KEY ""C"" TO CHANGE THE DIFFICULTY."
 35 PRINT
 40 PRINT "SCORING"
 45 PRINT
 50 PRINT """X""= 10 POINTS"
 55 PRINT
 60 PRINT """█""= 20 POINTS"
 65 PRINT
 70 PRINT """█""= 20 POINTS"
 75 PRINT
 80 PRINT """█""= 20 POINTS"
 85 PRINT
 90 PRINT TAB 4;"PRESS ANY KEY TO START ";AT 21,9;"C TO CHANGE"
 95 LET HI=0
100 GOTO 170
160 PRINT AT 11,4;"PRESS ANY KEY TO START";AT 13,9;"C TO CHANGE"
170 IF INKEY$<>"" THEN GOTO 170
180 IF INKEY$="" THEN GOTO 180
185 IF INKEY$="C" THEN GOTO 300
190 LET L=USR 16549
195 GOTO 600
200 PRINT AT 9,9;"GAME OVER"
210 GOSUB 400
220 GOTO 160
300 CLS
305 PRINT "ENTER DIFFICULTY (1 TO 10)","1=EASY",,"10=HARD"
310 INPUT A
315 IF A<1 OR A>10 THEN GOTO 310
320 POKE 16859,(A*10)
325 POKE 16541,(A*2)
330 PRINT
335 PRINT "ENTER SPEED (0 TO 9)","0=SLOW",,"9=FAST"
340 INPUT A
350 IF A<0 OR A>9 THEN GOTO 340
360 POKE 16886,(9-A)
390 GOTO 160
400 LET A$=""
410 LET A=PEEK 17282+256*PEEK 17283
420 FOR N=1 TO 4
430 LET A$=CHR$ (PEEK A-128)+A$
440 LET A=A-1
450 NEXT N
460 LET S=VAL A$
470 IF S>HI THEN GOSUB 500
480 RETURN
500 LET HI=S
510 LET A=17275
520 FOR N=1 TO 4
530 POKE A,(CODE A$(N)+128)
540 LET A=A+1
560 NEXT N
570 RETURN
600 LET L=PEEK 16545
610 LET A=PEEK 17282+256*PEEK 17283
620 POKE (A+9),(L+156)
630 IF L=0 THEN GOTO 200
640 LET L=USR 17185
650 GOTO 600
1000 SAVE "ROT█"
1010 RUN
```

Machine code.

```
16516: ED5B32400632EFD7A = 962
16524: B70500ED5299ED52 = 979
16532: 985F50ED52300123 = 730
16540: 2232407DC900009A = 625
16548: 4C21A14036032A0C = 445
16556: 4011860219116243 = 472
16564: 06201A77231310FA = 503
16572: 111500A7ED522282 = 588
16580: 432A0C400E152336 = 309
16588: 0523061E36002310 = 181
16596: F83685230020EF2A = 799
16604: 0C40233E03062077 = 338
16612: 2310FC2A3243111E = 559
16620: 00A7ED5222A34021 = 780
16628: 3443064036002310 = 374
16636: FB21D942360ACDEE = 1074
16644: 4121D9424E218443 = 591
16652: 227840237EFE00C2 = 330
16660: 3A41CD8440E60FC8 = 957
16668: 2916005F2A0C4019 = 301
16676: E82A7B4073237223 = 763
16684: E5CD8440E603E177 = 1207
16692: 230D20D418042323 = 390
16700: 18F7CDEE41210942 = 1095
16708: 4E213443227B405E = 625
16716: 2358237EFE00CCA5 = 935
16724: 41FE01CCAA41FE02 = 1015
16732: CC8141FE03CCC141 = 1188
16740: 3E00127EFE05CC81 = 848
16748: 41FE85CCC141FE06 = 1174
16756: CCDA42FE1BCA8141 = 1168
16764: FE00C4DB4370CDD5 = 1266
16772: 41E82A7B40732372 = 793
16780: 23230DC248412103 = 663
16788: 427EFE002003C302 = 678
16796: 413600CD2443C318 = 646
16804: 43D5E1063DC92121 = 839
16812: 001906830C92A7B40 = 559
16820: 2323360022122019 = 218
16828: 06813E00C92A7B40 = 627
16836: 2323360032120019 = 217
16844: 05823E00C9210000 = 432
16852: C9D5E5CD8440C632 = 1292
16860: 300DE1E511210019 = 590
16868: 7EFE0020023618E1 =,720
16876: D1C92AA340227B40 = 900
16884: 110104187BB220FB = 633
16892: EB2125407EFEF7CC = 1200
16900: 9842FEE7CC984221 = 1164
16908: 25407EFEF7CC8E42 = 1141
16916: FEF5CC8E422A7B40 = 1140
16924: 3800233600EB3606 = 438
16932: 2336042B22A34021 = 430
16940: 26407EFEFDCC7642 = 1123
16948: FEF5CC7642FEDDCC = 1566
16956: 76422AC2437CFE00 = 865
16964: 282C3600112100A7 = 355
16972: ED827EFE3DCCA542 = 1195
16980: FE3DCCC443FE81CC = 1436
16988: C443FE82CCC443FE = 1368
16996: 18CC5943FE00C48A = 975
17004: 42381722C243CDE1 = 868
17012: 42C92AC2437CFE00 = 946
17020: C02AA340112100A7 = 678
17028: ED5222C243C92100 = 848
17036: 00C9136268237EFE = 840
17044: 002801183E00C918 = 358
17052: 1AFE002801133E00 = 402
17060: C93507ED4BD94206 = 863
17068: 073510FDEB216443 = 798
17076: 7EB8200B237EBA28 = 743
17084: 0923230D20F2C923 = 602
17092: 18F73600CD8A422A = 776
17100: 32437E3CFEA6CA45 = 1074
17108: 4377EBC9000AE521 = 594
17116: D84277E1C92A0C40 = 945
17124: 118102191121000E = 285
17132: 1406207EFE1BCCFD = 922
17140: 422810F72B0D20F1 = 701
17148: C8197EFE00200836 = 700
17156: 18A7ED523600C9FE = 1022
17164: 06CCDA42FE04CCDA = 1174
17172: 42C3054321A1407E = 717
17180: 3DFE0077C9C3C540 = 1091
17188: 160A2A0C40230E16 = 221
17196: 06207EC680772310 = 660
17204: F9230D23F31520EA = 354
17212: 11C8C8187B8220FB = 1028
17220: C8369C2BE521D942 = 999
17228: 7E3CFE1520023E14 = 577
17236: 7700C3CB433600CD = 843
17244: 0A42C90000008030 = 661
17252: B8A8B4B7AA949C9C = 1348
17260: 9C9C9C8081AEBBAA = 1304
17268: 88949F80ADAE949C = 1270
17276: 9C9C9C9C8080B84C = 1140
17284: 2E1A002E4A00284A = 349
17292: 00024B00254A0024 = 226
17300: 4A00C94800294A02 = 575
17308: 4F4C03284A000000 = 272
17316: 0000000000000000 = 0
17324: 0000000000000000 = 0
17332: 0000000000000000 = 0
17340: 0000000000000000 = 0
17348: CDA542CDCB42C921 = 1144
17356: 8443061423233801 = 350
17364: 2310F9E1C3CE42FE = 1248
17372: 172011CDCB42CDCB = 954
17380: 422AC24336002100 = 456
17388: 0022C243210000C9 = 529
```


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Tom Fiers feeds a hungry Dragon.

GOBBLER

THIS GAME IS totally written in machine language and allows either keyboard or joystick control. It features PMode 1 high resolution colour graphics, smooth movement, more than 10 different sound effects, multiple screens, high score, increasing difficulty and best of all an incredible speed!

The four powerpills are blinking in the corners of the maze; if you gobble one of them the ghosts can be eaten. The six keys control the doors of the tunnel and the walls that hide the fruit. Swallowing the appropriate key will give access to a tunnel entrance, but you still can't use it as both sides must be open. And do not forget the ghosts too can make use of the tunnel!

Your score is indicated on the screen as are your level and remaining lives — you get an extra one at 10,000 points.

There isn't a fixed score which you can attain in one level. The point range runs from 1,000 to 22,000. Each time as you eat something, the minimum points of that object are multiplied by the multiplier, a part of the scorecounter. This multiplier normally contains a 1 so that a pill — worth 5 points — is still worth 5 points. But if you eat a ghost, then the multiplier is doubled.

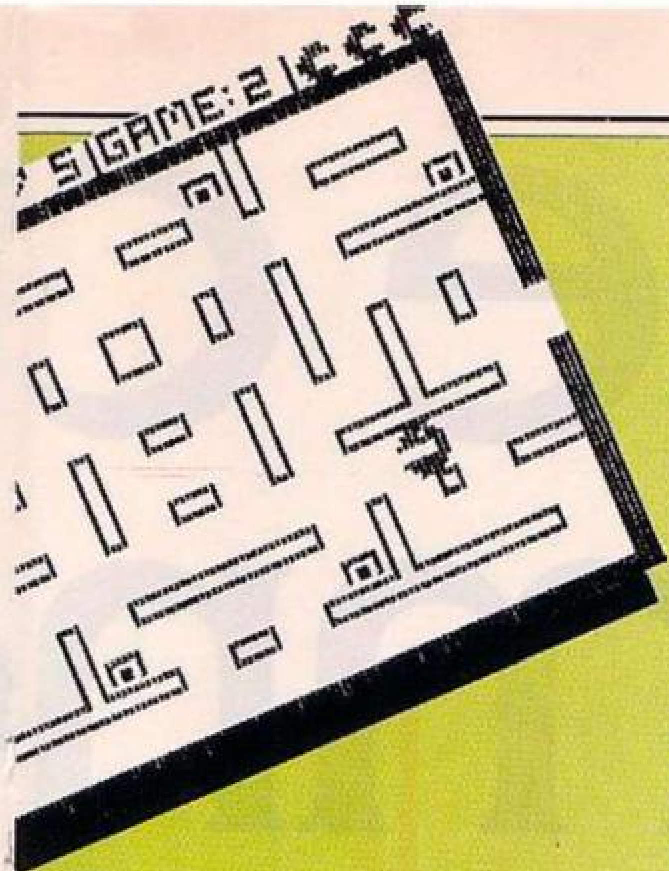
The random bonus, which has the shape of a wafer and appears from time to time, has the same effect.

Press any key if you get the Game Over message. Just change the addresses given in table 1 if you want to set some of the main variables to your own playing standards. If you do not have a colour TV you will have to do these Pokes to see the difference between an edible and a normal ghost: 28974,150 26315,192 26140,207.

To enter the game, type in Basic listing 1 which will construct the maze. Check carefully for any error after running it. Make a copy of it if it seems alright with
CSAVEM"PACSCRN",&H2A00,&H35FF,0
Do also make a copy of the Basic version to be safe in case of a crash. Now you can enter the game itself with listing 2. Run it, give in the

Listing 1.

```
5 REM PRESS ENTER AFTER PSET(186,6,6) IN LINE 100, MAK
ING 110 THE START OF A NEW LINE
10 REM SCREEN FOR PACMAN
70 PCLEAR8:CLEAR1000,26000
80 PMODE1,7:SCREEN1,1:PCLS
90 DRAW"C4BM4,0NR[illegible]"
100 PSET(186,7,6):PSET(186,6,6):DRAW"BM144,[illegible]":PSE
T(186,7,6):PSET(186,6,6):110 DRAW"BM124,100C4[illegible]"
120 A$="[illegible]":B$="[illegible]":C$="[illegible]"
130 FOR I=1 TO 6:READX,Y:DRAW"BM"+STR$(X)+","+STR$(Y)+
B$:NEXTI:GOTO150
140 DATA12,126,84,22,84,150,164,22,164,150,234,126
150 FOR I=1 TO4:READX,Y:DRAW"BM"+STR$(X)+","+STR$(Y)+A
$:NEXTI:GOTO170
160 DATA14,162,14,34,238,162,238,34
170 FOR I=1 TO 87:READX,Y:DRAW"BM"+STR$(X)+","+STR$(Y)
+C$+";BM"+STR$(252-X)+","+STR$(Y)+C$:NEXTI:GOTO260
180 DATA14,24,26,24,34,24,42,24,50,24,62,24,98,24,106,
24,114,24,126,24,62,36,86,36,126,36
190 DATA14,48,26,48,34,48,42,48,50,48,62,48,74,48,86,4
8,98,48,110,48,126,48,62,60,86,60,110,60
200 DATA86,60,110,60,14,72,26,72,38,72,50,72,62,72,86,
80,98,80,110,80,122,80
210 DATA14,84,38,84,62,84,14,92,38,92,62,92,86,92,110,
92,26,104,38,104,62,104
220 DATA74,104,86,104,110,104,14,116,86,116,110,116,26
,128,38,128,50,128
230 DATA62,128,74,128,86,128,98,128,110,128,38,140,62,
140,86,140,14,152,26,152,38,152
240 DATA50,152,62,152,98,152,110,152,122,152,110,164,1
4,176,26,176,34,176,42,176
250 DATA50,176,58,176,66,176,74,176,82,176,90,176,98,1
76,110,176
260 D$="C4R24[illegible]":DRAW"BM24,114"+D$+"BM
176,114"+D$
270 READX,Y,X1,Y1:IF X=999 THEN 330 ELSE LINE(X,Y)-(X1
,Y1),PSET,B:LINE(254-X,Y)-(254-X1,Y1),PSET,B:GOTO270
280 DATA24,34,34,40,96,34,118,40,0,12,252,190,4,14,250
,188,6,16,248,186
290 DATA72,16,78,40,6,58,34,64,72,58,78,96,96,58,102,7
2,130,58,134,72
300 DATA24,82,30,96,96,90,102,120,120,90,134,114,120,9
6,134,120,6,138,30,144
310 DATA48,138,54,144,96,138,158,144,72,138,78,162,24,
162,102,168
320 DATA120,162,134,168,120,168,134,186,999,0,0,0
330 FOR I=1 TO 4:READX,Y:PRESET(X,Y):NEXTI:LINE(140,0)
-(140,12),PSET:LINE(206,0)-(206,12),PSET
340 DATA74,162,76,162,178,162,180,162
350 IF INKEY$="" THEN 350
360 CLS:END
```



DRAGON

Hexloader.

```
5 REM HEXLOADER
10 PCLEAR8
100 'COMPARE ADDRESS AND ENTER LINE
110 'WITH CHECKSUM AND NUMBERS AS PRINTED
115 'EG. TYPE FOR ADDRESS 26000 TYPE IN THE ENTIRE LIN
E FROM 7E TO 505 WITH SPACES BETWEEN THE NUMBERS
120 CLS:CLEAR2000,26000
130 INPUT"ENTER START ADDRESS";A
140 R=0
150 CLS:PRINT"ADDRESS ";A:PRINT:PRINT"ENTER LINE:":PRI
NT
160 LINE INPUT A$
170 IF A$="END" THEN END ELSE IF A$="NEW" THEN 130
175 'ENTER END TO END AND NEW TO CHANGE START ADDRESS
180 FOR X=1 TO 10
190 Z=VAL("&H"+LEFT$(A$,2))
200 POKE A,Z
210 A=A+1:R=R+Z
220 A$=MID$(A$,4)
230 NEXTX
240 R1=VAL("&H"+A$)
250 IF R1=R THEN 270
260 PRINT "DATA ENTRY ERROR":R=0:SOUND1,4:A=A-10:FOR T
=1 TO 1000:NEXTT:GOTO150
270 R=0:GOTO150
280 END
```

start address and start entering the program line by line.

An error check is included. If you type it in in parts, then save each part as

CSAVEM"PACMAN",26000,X,0

where X is the address you reached. Do not forget to load it before entering a new part. ave the complete program after

"PACSCRN"

with X = 32760. To play it type:

PCLEAR8:CLEAR100,26000 CLOADM:

CLOADM:EXEC 2600

Table 1.

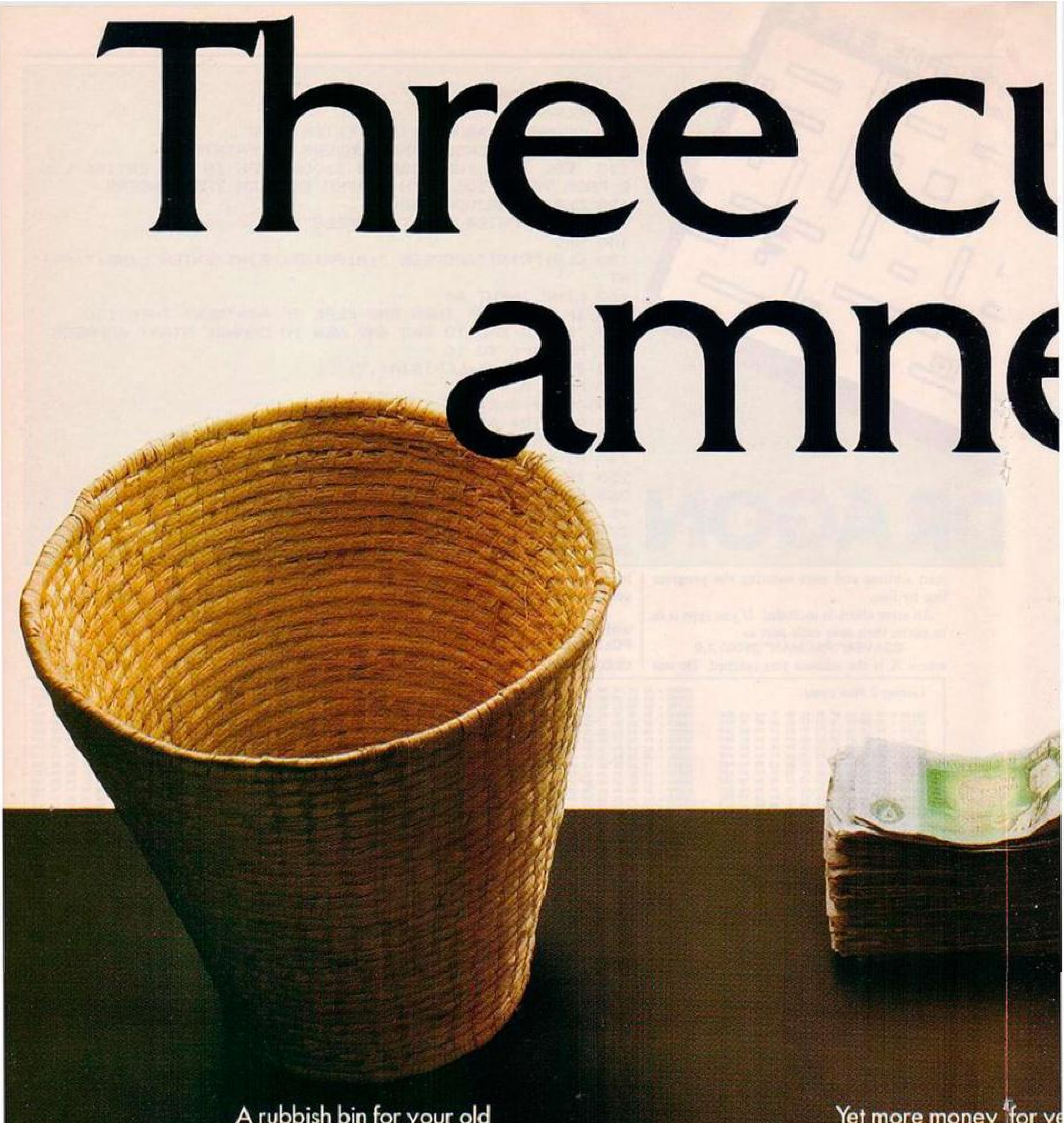
Function	Address	Value	Default
Lives	26264	1-15	3
ProgramDelay	26644	1-10	5
Pacman Delay	26697	10-255	20
Time Ghosts	26290	20-255	120

Listing 2 Hex code.

```
26000 : 7E 66 00 BF 7F E1 B6 7F 07 C6 505
26010 : 20 30 FD 7E 30 CC 01 C0 B3 7E 4C6
26020 : 30 C3 10 00 F3 7F E1 1F 02 EE 463
26030 : A4 CF 09 00 E0 EE A9 00 02 EF 5B4
26040 : 89 00 E2 39 00 FF FF FF 00 00 4A1
26050 : 26 03 7E 7E F4 7E 6E F1 00 7F 475
26060 : 7C CA BD BA 77 BD B0 12 39 00 4BC
26070 : 00 00 B6 3F B7 FF 23 7F FF 20 43C
26080 : C6 64 B6 7F 07 48 B7 7E 26 73 480
26090 : FF 20 7C 7E 2A B6 7E 2A 4A 26 411
26100 : F0 5A 26 F1 06 37 B7 FF 23 39 538
26110 : 00 FA BD A5 CB 8E 04 28 BF 00 463
26120 : 8D 8E 7D A5 BD 90 E5 8E 05 63 520
26130 : BF 00 BB 8E 7D 40 BD 90 E5 B6 552
26140 : EF 1F E9 8E 04 00 ED 84 ED 89 510
26150 : 01 E0 30 89 00 02 8C 04 20 25 271
26160 : F1 30 E9 FF FF ED 84 30 89 00 5D2
26170 : 20 8C 05 E0 25 F5 4F 10 8E 7C 414
26180 : E8 8E 04 A4 EE A1 EF 81 4C 81 5EA
26190 : 0C 25 F7 30 89 00 08 4F 8C 05 2C9
26200 : 05 23 ED 8E 05 C4 BF 00 88 8E 441
26210 : 7C CB BD 90 E5 BD B8 E5 27 FB 6FA
26220 : 01 48 26 05 7F 7F FC 20 05 B6 39C
26230 : 01 B7 7F FC 8E 2A 00 10 8E 1E 3A7
26240 : 00 EC 81 ED A4 ED A9 F4 00 ED 675
26250 : A9 E8 00 31 A9 00 02 10 8C 2A 333
26260 : 00 25 EA 86 03 B7 7F 53 B6 01 3A8
26270 : B7 7F 4E 10 8E 00 00 10 BF 7F 370
26280 : 27 10 BF 7F 29 10 BF 7F 2B B6 39D
26290 : 78 B7 7F 00 B7 FF C5 B7 FF C7 6A1
26300 : B7 FF C9 B7 FF C9 B7 FF C7 B6 828
26310 : FF 22 B4 CF BA C8 B7 FF 22 B6 624
26320 : AF B7 7F 57 CC 01 01 FD 7F 35 488
26330 : FD 7F 37 FD 7F 39 FD 7F 3B FD 61C
26340 : 7F 22 FD 7F 24 B6 7F 00 81 0F 406
26350 : 23 02 8D 0A B7 7F 00 7F 7F 4F 332
26360 : CC 00 00 FD 7F 2F FD 7F 31 B6 4AA
26370 : 01 B7 7F 4D B7 7F FD B7 7E A0 58C
26380 : B7 7E A2 B7 7E 2C B7 7F 29 7F 518
26390 : 7F 2E CC 00 0F FD 7F F6 FD 7F 576
26400 : F9 FD 7F F3 FD 7F FD B6 02 B7 713
26410 : 7E A1 CC 00 01 FD 7E 97 B7 7E 533
26420 : 99 FD 7E A3 FD 7E A5 B7 7F FE 708
26430 : B7 7F 26 B6 30 B7 7F FB B6 15 4EB
26440 : B7 7F F8 B7 7F F5 B7 7F F2 8E 70F
26450 : 1E 18 B6 7F 4E BD 7C CB 4F BD 4C9
26460 : 7F E9 BD 7E 9A 8E 12 00 10 8E 47B
26470 : 1E 00 EE A1 EF 89 F4 00 EF 01 5B9
26480 : 8C 1E 00 25 F3 8E 14 AF 10 8E 3B1
26490 : 7F C0 BD A7 8B 8E 19 AF 10 8E 4E2
26500 : 7F A8 7E A8 0A 20 16 7F 7F 07 312
26510 : EC A1 ED 84 30 89 00 20 7C 7F 4D2
26520 : 07 B6 7F 07 81 08 25 EE 39 8E 3A6
26530 : 0C 2C CC 00 00 ED 89 00 C0 ED 427
26540 : 81 8C 0C 34 25 F5 8E 0C 4C 10 350
26550 : 8E 7E 6E 5F A6 A0 84 0F A7 84 400
26560 : 5C 30 89 00 20 C1 05 25 F1 30 341
26570 : 89 FF 61 7F 7F 07 5F A6 A0 A7 536
26580 : 84 5C 30 89 00 20 C1 05 25 F3 397
26590 : 30 89 FF 61 7C 7F 07 F6 7F 07 497
26600 : E1 07 25 E4 BD 7C AF BD 7D 8F 542
26610 : BD AE 63 7E A8 13 8E 12 00 10 337
26620 : 8E 06 00 EC 81 ED A1 10 8C 12 430
26630 : 00 25 F6 39 BD A7 BB BD A7 F0 51F
26640 : 7E 67 A1 B6 05 B8 7F FC 21 08 470
26650 : C6 FA 3D 83 00 01 26 FB B6 7F 4D7
26660 : FE 27 18 B6 7F FB 81 01 26 03 410
26670 : 7E 7F 3E 81 02 26 03 7E 7F 41 325
26680 : 81 03 26 03 7E 7F 44 7E 7F 47 332
26690 : 7C 7E FF B6 7E FF C6 14 F0 7F 675
26700 : 4E F7 7F 07 81 7F 07 25 0C 7F 382
26710 : 7E FF 8E 7F FB BD A8 C4 7E 7F 668
26720 : DA B6 7F FC 27 25 BD 00 12 B6 55C
26730 : 01 5A 81 3A 25 03 7E A9 01 81 2A7
26740 : 05 22 03 7E 7F 41 B6 01 58 01 2F8
26750 : 3A 25 03 7E 7F 47 81 05 22 D0 31E
26760 : 7E 7F 44 BD BB E5 10 8E FF FF 63A
26770 : 10 BF 01 50 10 BF 01 52 10 BF 311
26780 : 01 54 10 BF 01 56 10 BF 01 58 2A3
26790 : 81 09 26 03 7E 7F 3E 81 08 26 29B
26800 : 03 7E 7F 41 81 5E 26 03 7E 7F 346
26810 : 44 81 0A 10 26 FF 97 7E 7F 47 38F
26820 : A6 84 C6 20 3D E3 06 00 E3 89 4B2
26830 : FF FE 1F 01 39 10 8E 7F 58 EC 4B7
26840 : A1 ED 84 30 89 00 20 10 8C 7F 406
26850 : 68 25 F2 30 89 FF 00 39 10 8E 40E
26860 : 7F 68 EC A1 ED 84 30 89 00 20 48E
26870 : 10 8C 7F 78 25 F2 30 89 FF 00 462
26880 : 39 8E 7F F8 BD A8 C4 B6 7F FE 658
26890 : 27 58 4C 81 04 25 4D F6 7F FA 431
26900 : C1 1F 26 26 7F 7F FA CC 00 00 3F0
26910 : A7 84 30 89 00 20 5C C1 08 25 34E
26920 : F5 30 89 FE E1 7F 7F FE 8D A8 6AE
26930 : D3 EC 89 19 00 EB 89 01 00 7E 456
26940 : 7F 26 7C 7F FA 5F A6 89 18 00 4F4
26950 : A7 84 5C 30 89 00 20 C1 08 25 34E
26960 : F1 30 89 FF 01 7F 7F FE 8D A8 5C8
26970 : D3 7E 7F DA B7 7F FE 7E A9 89 67E
26980 : A6 89 00 02 84 C0 81 40 10 27 368
26990 : 00 51 8C 0C 3E 27 0C A6 89 00 289
27000 : E2 84 C0 81 40 10 27 00 40 A6 404
27010 : 89 18 62 81 01 26 10 30 89 18 294
27020 : 62 1F 12 30 89 E7 9E 4F A7 A9 470
27030 : 00 01 A7 A9 00 21 BD 7F E3 20 3B1
27040 : 11 81 14 26 0B 30 89 18 62 1F 228
27050 : 12 30 89 E7 9E 8B 7F E3 B6 01 4F6
27060 : 1F 89 FD 7F FD 7F 7F 33 B6 7F 587
27070 : FE 20 19 B6 7F FB 81 02 26 03 417
27080 : 7E 7F 41 81 03 26 03 7E 7F 44 32C
27090 : 81 04 26 03 7E 7F 47 7E 7F DA 3C9
27100 : 10 8E 7F 50 81 03 27 2F 81 02 282
27110 : 27 32 A6 89 18 02 BD 6A 45 31 33F
27120 : A9 FF FF 30 89 FF FF A6 89 00 6BD
27130 : 02 BD 6A 45 31 A9 00 03 30 89 304
27140 : 00 21 7C 7F 33 B6 7F 33 81 08 340
27150 : 25 D8 7E 7F DA 30 89 00 01 7E 40C
27160 : 6A 87 A6 89 18 02 BD 6A 5E 31 3F0
27170 : A9 FF FF 30 89 FE FF A6 89 00 6BD
27180 : 02 BD 6A 5E 31 A9 00 03 30 89 31D
27190 : 00 21 7C 7F 33 B6 7F 33 81 08 340
27200 : 25 D8 7E 7F DA E6 A9 00 01 C4 528
27210 : 03 27 02 8A 8D A7 89 00 02 E6 34E
27220 : A9 00 01 54 54 E7 89 00 01 39 2FC
27230 : EA A9 00 01 C4 0F 27 10 C1 02 358
27240 : 27 08 C1 08 27 02 8A 20 8A 80 207
27250 : 20 02 8A 20 A7 89 00 02 E6 A9 380
27060 : 1F 89 FD 7F FD 7F 7F 33 B6 7F 587
27070 : FE 20 19 B6 7F FD 81 02 26 03 417
27080 : 7E 7F 41 81 03 26 03 7E 7F 44 32C
27090 : 81 04 26 03 7E 7F 47 7E 7F DA 3C9
27100 : 10 8E 7F 50 81 03 27 2F 81 02 282
27110 : 27 32 A6 89 18 02 BD 6A 45 31 33F
27120 : A9 FF FF 30 89 FF FF A6 89 00 6BD
27130 : 02 BD 6A 45 31 A9 00 03 30 89 304
27140 : 00 21 7C 7F 33 B6 7F 33 81 08 340
27150 : 25 D8 7E 7F DA 30 89 00 01 7E 40C
27160 : 6A 87 A6 89 18 02 BD 6A 5E 31 3F0
27170 : A9 FF FF 30 89 FE FF A6 89 00 6BD
27180 : 02 BD 6A 5E 31 A9 00 03 30 89 31D
27190 : 00 21 7C 7F 33 B6 7F 33 81 08 340
27200 : 25 D8 7E 7F DA E6 A9 00 01 C4 528
27210 : 03 27 02 8A 8D A7 89 00 02 E6 34E
27220 : A9 00 01 54 54 E7 89 00 01 39 2FC
27230 : EA A9 00 01 C4 0F 27 10 C1 02 358
27240 : 27 08 C1 08 27 02 8A 20 8A 80 207
27250 : 20 02 8A 20 A7 89 00 02 E6 A9 380
27260 : 00 01 54 54 54 54 E7 89 00 01 2C2
27270 : 39 A6 89 17 FF BD 6A 82 31 A9 571
27280 : 00 01 30 89 00 01 A6 89 FF FF 3E8
27290 : BD 6A 82 31 A9 00 01 30 89 00 36D
27300 : 1F 7C 7F 33 B6 7F 33 81 08 25 363
27310 : 8D 7E 7F DA E6 A4 C4 80 27 02 5A6
27320 : 8A 82 A7 89 FF FE E6 A4 58 58 5F4
27330 : E7 84 39 8E 7F FB BD A8 C4 B6 64B
27340 : 7F FE 27 58 4C 81 04 25 50 7F 3C4
27350 : 7F FE F6 7F FA 26 29 BD 70 BB 623
27360 : A7 84 30 89 00 20 5C C1 08 25 34E
27370 : F5 30 89 FF 00 CA 1F F7 7F FA 602
27380 : 30 89 00 1F A6 89 17 E0 A7 89 42E
27390 : FF E0 BD 68 EA 7E 7F DA 7A 7F 6BE
27400 : FA 5F A6 89 18 01 A7 89 00 01 3B2
27410 : 5C 30 89 00 20 C1 08 25 EF 30 342
27420 : 89 FE FF 8B 68 EA 7E 7F DA B7 723
27430 : 7F FE 7E 68 7D A6 89 00 8F 84 575
27440 : 05 81 01 27 68 8E 0C 20 27 0A 200
27450 : A6 89 FF FF 84 03 81 01 27 5C 489
27460 : A6 89 10 5F 81 40 26 18 30 89 35E
27470 : 18 5F 1F 12 30 89 E7 A1 4F A7 38F
27480 : A9 FF FF A7 A9 00 1F 8D 7F E3 635
27490 : 20 11 81 14 26 08 30 89 18 5F 229
27500 : 1F 12 30 89 E7 A1 BD 7F E3 B6 517
27510 : 02 B7 7F FD 7C 7F FE 7F 7F 33 55F
27520 : B6 7F FE 10 8E 7F 68 81 03 26 462
27530 : 07 30 89 FF FF 7E 69 E8 81 02 510
27540 : 26 07 30 89 FF FF 7E 6A 1A 7E 464
27550 : 6A 87 B6 7F FB 81 01 26 03 7E 44C
27560 : 7F 3E 81 03 26 03 7E 7F 44 81 32C
27570 : 04 26 03 7E 7F 47 7E 7F DA 4F 397
27580 : A7 A4 A7 A9 00 20 7E 78 15 7F 445
27590 : EC 86 05 8D 7F E9 35 30 7A 7F 4FA
27600 : 57 39 CE 00 00 31 A9 18 00 ED 338
27610 : A4 ED A9 00 20 ED A9 00 40 ED 51E
27620 : A9 00 A0 ED A9 00 80 ED A9 00 485
27630 : A0 39 8E 7F FB 8D A8 C4 B6 7F 5FF
27640 : FE 27 0C 4C 81 04 25 01 4F B7 32E
27650 : 7F FE 7E 6C 44 EC 89 FF E0 81 680
27660 : 55 27 4C C1 55 27 48 EC 89 17 309
27670 : A0 10 83 01 40 27 59 EC 89 17 380
27680 : 80 10 83 01 40 26 15 CC 00 00 258
27690 : ED 89 FF 80 ED 89 FF 60 ED 89 740
27700 : 17 80 ED 89 17 A0 20 3A B6 03 367
27710 : B7 7F FB 7C 7F FE 30 89 FF E0 6C4
27720 : 7A 7F FB 80 A8 B3 10 AE 89 19 54C
27730 : 00 10 AF 89 01 00 7E 7F DA B6 3D6
27740 : 7F FD 81 01 26 03 7E 7F 3E 81 3E3
27750 : 02 26 03 7E 7F 41 81 04 26 03 217
27760 : 7E 7F 47 7E 7F DA 30 89 17 A0 489
27770 : 1F 12 30 89 E8 A0 4F A7 A9 00 3D1
27780 : 01 A7 A9 00 21 BD 7F E3 20 AE 45F
27790 : 8E 7F FB 8D 68 C4 B6 7F FE 27 649
27800 : 0C 4C 81 04 25 01 4F B7 7F FE 386
27810 : 7E 6C E2 EC 89 01 00 81 55 27 43F
27820 : 4C C1 55 27 48 EE 89 19 20 10 38F
27830 : 83 01 40 27 52 EC 89 19 60 10 338
27840 : 83 01 40 26 15 CE 00 00 ED 89 341
27850 : 01 60 ED 89 01 80 EB 89 19 60 447
27860 : ED 89 19 80 20 33 B6 04 B7 7F 422
27870 : FD 7C 7F FE 30 89 00 20 7E 7F 4CA
27880 : FB 80 A8 EA 10 AE 89 17 E0 10 558
27890 : AF 89 FF E0 7E 7F DA B6 7F FD 720
27900 : 81 01 26 03 7E 7F 3E 81 02 26 28F
27910 : 03 7E 7F 41 7E 7F DA 30 89 17 3EA
27920 : 20 1F 12 30 89 E6 E0 4F A7 A9 46F
27930 : 00 01 A7 A9 00 21 BD 7F E3 20 3B1
27940 : 85 CC 00 00 1F 02 8E 06 1A 10 260
27950 : AF 84 10 AF 89 00 02 10 AF 89 3C5
27960 : 00 04 30 89 00 20 8C C1 06 25 225
27970 : EA F6 7F 51 C1 01 22 01 39 B6 456
27980 : 01 8E 06 1E 10 8E 02 A0 10 AF 282
27990 : 84 10 AF 89 00 A0 10 8E 0A A8 38C
28000 : 10 AF 89 00 20 10 AE 89 80 80 350
28010 : 10 8E 2A 00 10 AF 89 00 40 10 260
28020 : AF 89 00 A0 4C 30 89 FF FE 81 548
28030 : 7F 53 25 CE 39 F6 7F 48 30 10 40D
28040 : 83 07 E8 25 08 83 03 E8 7C 7F 404
28050 : 2A 20 F2 10 83 00 64 25 08 83 3E3
28060 : 00 64 7C 7F 29 20 F2 C1 0A 25 386
28070 : 07 C0 0A 7C 7F 28 20 F5 C1 00 3CA
28080 : 27 06 5A 7C 7F 27 20 F6 8E 06 353
28090 : 10 10 8E 7F 27 A6 A4 81 08 25 34E
28100 : 06 80 0A 6C A9 00 01 A7 A4 BD 36E
28110 : 60 B8 31 A9 00 01 10 8C 7F 29 369
28120 : 23 E5 39 81 00 26 05 CC 7E 5F 396
28130 : 20 07 4A C6 05 3D C3 7E 32 1F 308
28140 : 23 1F 02 4F E6 A0 E7 84 30 89 430
28150 : 00 20 4C 81 05 25 F3 30 89 FF 3C2
28160 : 5E 1F 32 39 8D 68 D2 34 30 8D 403
28170 : 7F 50 B6 19 BB AD 83 25 30 7A 3FA
28180 : 7F 57 B6 01 B7 7F 2F B7 7F 30 42B
28190 : B7 7F 31 B6 7F 00 B7 7F 4F B6 4A7
28200 : 01 B7 7F 4D B6 7E A4 84 01 81 462
28210 : 01 27 01 39 1F 13 8E 00 AF 10 3EE
28220 : 8E 7F D0 A6 A0 A7 84 A7 89 00 57E
28230 : 01 30 89 00 20 10 8C 7F D8 25 2F2
28240 : EE BD 7F 4A B6 7F 4D 48 B7 7F 574
28250 : 4D B6 01 B7 7F 26 1F 31 39 BD 376
28260 : 67 FB 4F BD AD 83 BD AD 25 B6 530
28270 : 45 B7 06 14 8E 06 34 5F B6 44 307
28280 : A7 84 5C 30 89 00 20 C1 04 25 34A
28290 : F5 39 B6 7D 92 27 03 7E 7D 74 48C
28300 : 7C 7F 21 B6 7F 57 26 03 7E 7F 3CE
28310 : 54 B6 7F 21 81 20 25 50 7F 7F 3CB
28320 : 21 B6 7F 08 27 09 7F 7F 08 10 2A4
28330 : 8E 7F 09 20 07 7C 7F 08 10 8E 28E
28340 : 7F 15 B6 7F 22 27 09 8E 08 01 282
28350 : 7F 7F EF BD 6E F0 B6 7F 23 27 587
28360 : 09 8E 08 1D 7F 7F EF BD 6E F0 4C4
28370 : B6 7F 24 27 09 8E 10 01 7F 7F 326
28380 : EF BD 6E F0 B6 7F 25 27 09 8E 522
28390 : 10 1D 7F 7F EF BD 6E F0 20 13 468
28400 : 4F EE A1 EF 84 30 89 00 20 4C 476
28410 : 7E 7E EE EF 81 06 25 EE 39 8E 53A
28420 : 7F FB BD 68 C4 B6 7F 24 27 10 4F3
28430 : 8C 0F E1 26 08 7F 7F 24 1F 12 300
28440 : BD 7F E6 7E 7E EB B6 7F 25 27 5BA
28450 : 10 8C 0F FD 26 0B 7F 7F 25 1F 318
28460 : 12 BD 7F E6 7E 7E EB B6 7F 22 572
28470 : 27 10 8C 07 E1 26 08 7F 7F 22 2FC
28480 : 1F 12 BD 7F E6 7E 7E EB B6 7F 56F
28490 : 23 27 10 8C 07 FD 26 08 7F 7F 319
28500 : 23 1F 12 BD 7F E6 7E 7E EB B6 513
28510 : 7F 36 27 17 8C 0F 2A 26 12 B6 276
28520 : 3F 10 8E 10 AF BD 6F 95 BD 6F 489
28530 : BD 7F 7F 36 7E 7E EB B6 7F 37 544
28540 : 27 51 8C 0F 34 26 4E B6 FC 10 348
28550 : 8E 10 B0 BD 6F 95 BD 6F BD 7F 577
28560 : 7F 37 7E 7E EB B7 7F EF 4F E6 5F7
28570 : A9 18 00 F4 7F EF E7 A9 18 00 4C8
28580 : E7 A4 31 A9 00 20 4C 81 08 25 37F
28590 : EA 30 89 00 20 1F 12 30 89 FF 36C
28600 : E0 BD A8 D2 39 34 30 8B 7F 01 484
28610 : B6 14 BD 7F E9 35 30 B6 01 B7 462
28620 : 7F 4D 39 B6 7F 35 27 30 8C 10 362
28630 : AF 26 28 B6 7F 57 81 01 26 09 338
28640 : B6 64 34 30 8D 7F E9 35 30 7F 457
28650 : 7F 35 1F 12 BD A8 D2 E8 A9 00 475
28660 : C0 EB A9 00 E0 BD 7F 04 B6 28 524
28670 : BD 7F E9 7E 7E EB B6 7F 36 27 5A2
28680 : 17 8C 07 2A 26 12 B6 3F 10 8E 26F
28690 : 0C 2F BD 6F 95 BD 6F BD 7F 7F 4E3
28700 : 36 7E 7E EB B6 7F 39 27 17 8C 459
28710 : 07 34 26 12 B6 FC 10 8E 0C 30 2CF
28720 : BD 6F 95 BD 6F BD 7F 7F 39 7E 55F
28730 : 7E EB B6 7F 38 27 20 8C 0C 2F 3E4
28740 : 26 1B 7F 7F 38 1F 12 BD 6B 02 3A2
28750 : EB A9 00 C0 ED A9 00 E0 BD 7F 608
28760 : 04 B6 28 BD 7F E9 7E 7E EB B6 574
28770 : 7F 3C 27 16 8C 0D A1 26 11 4F 288
28780 : 10 8E 0C 20 BD 6F 95 BD 6F BD 474
28790 : 7F 7F 3C 7E 7E EB B6 7F 38 27 480
28800 : 16 8C 0D BD 26 11 4F 10 8E 0C 29C
28810 : 3F BD 6F 95 BD 6F BD 7F 7F 38 522
28820 : 7E 7E EB B6 7F 26 27 37 8C 00 439
28830 : AF 26 32 7F 7F 26 1F 12 BD 68 384
28840 : D2 ED A9 00 C0 ED A9 00 E0 BD 658
28850 : 7B 00 B6 C8 BD 7F E9 20 1B CC 4FF
28860 : 00 00 A7 89 00 01 30 89 00 20 20A
28870 : 5C C1 08 25 F3 30 89 FF 00 CC 4C1
28880 : 00 00 39 B6 7F 4F 27 1D B6 7E 335
28890 : FE 4C 81 05 25 12 4F 7A 7F 4F 39E
28900 : F6 7F 4F 26 09 FD 7F 2F B7 7F 404
28910 : 31 7E 70 F9 B7 7E FE 12 12 12 481
28920 : 12 B6 7F 4F 10 21 00 C4 7C 7E 385
28930 : A6 B6 7E A6 F6 7F 4E 5C 5C F7 5F2
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(listing 2 continued on page 108)

Three cu amne



Believe it or not, computers often suffer from amnesia.

99% start off with large enough memories, but operating functions like text, colour, sound and more particularly high resolution graphics, take large bytes out of them. Leaving very little "useable" memory for programming and games.

Not so the new Oric Atmos 48K.

This is the one home computer that takes these normal working functions in its stride.

Unlike other home computers it uses the highly sophisticated serial attribute handling method used by Viewdata and Teletext, in which the attributes are stored on the screen alongside the data, instead of taking up space in the memory.

Thus the Oric Atmos never offers less than a healthy 37K of useable memory – even when the new colour printer and disc drive unit are attached. (Technical buffs see details overleaf).

So it rivals the performance of the supposedly larger, more expensive Commodore 64K, which unfortunately loses 26K of its "elephantine" memory in high resolution graphics.

It beats its immediate competitors like the Sinclair Spectrum, Dragon 32K, Vic 20 and Atari 600.

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The new Oric Atmos 48K.

It beats the Lynx 48K, which costs over a third more, yet loses 34K.

It even beats the Acorn Electron and the BBC Micro which costs more than twice as much, yet loses 23K in high resolution graphics.

And while this may surprise you, it's totally in keeping with a company recognised in the computer industry for performance and innovation.

Like its predecessor, the Oric-1, the Oric Atmos has the powerful loudspeaker and amplifier unit that prompted "Which Micro" (November issue) to comment… "Its sound facilities have more in common with those of the £400 Beeb, than the rather pathetic beep of the Spectrum. At full volume it can compete with most arcade games…"

Yet the Oric Atmos 48K costs a mere £170, including all the leads and adaptors you need to get it going.

So if you're buying a computer, remember our name. We could save you a fortune on bolt-ons… or wastepaper bins.

The new Oric Atmos 48K. ORIC

Now we've whetted your appetite, here's something to get your teeth into.

Printer Technical Specifications

Printer/ Plotting system	Ball Point Pen, 4 colour
Plotting speed: (horizontal)	52 mm/sec (2.05ips)
(vertical)	73 mm/sec (3.08ips)
Printer Speed	12 characters per second
Resolution	0.2 mm/step (0.00787 inch)
Effective plotting range	96 mm (3.804 inch) x axis, divided into 480 steps. (No limit in y direction)
Characters per line	80 or 40 text mode (determined by software in graphics mode)
Characters per line	INT (480/n+1) *6) for 0=n=15
Accuracy (repetition)	0.2 mm max
(movement)	0.3 mm max
(distance)	0.5% max (x−axis) 1% (y−axis)
Pen life	250 metres (825 feet)
Parallel interface	8−bit parallel Uses STROBE and ACKNOWLEDGE
Temperature range	18.3 to 35°C (65 to 96°F)
storage	−40 to 71°C (.40 to 160°F)
Humidity range	10% to 80% relative non-condensing
Power supply	Switching power supply input 100−120 VAC 200−240 VAC
Dimensions	10¾" wide 6⅞" deep 2½" high

Atmos Technical Specifications

CPU	6502 A
Memory	Choice of 16K or 48K RAM
Memory (48K Model)	Minimum 48K RAM, max 64: 16K ROM external control signals allow use of full 64K RAM or maybe used externally to increase ROM/RAM
Language	Extended Microsoft basic
Keyboard	Typewriter style and pitch, 57 keys, standard computer layout, additional cursor control keys, autorepeat facility, tactile and acoustic feedback
Display	Output for B&W or colour TV, RGB output for colour monitor.
Text format	40 line x 28 rows
Character set	Similar to Teletext format, standard ASCII double height, flashing, 80 user definable characters
Graphics	240 x 200, 8 colours
Graphic Facilities	Points, lines, circles
Sound	Internal loudspeaker and amplifier. 3-Channel sound synthesiser envelope control, amplitude control 8 octaves, noise channel
Storage	Most cassette recorders via DIN socket 300 or 2400 BAUD. Disc Drive.
Interface	Centronics, expansion port, Hi-fi, RGB Monitor, UHF TV, cassette recorder
Other	Warm reset to regain control without clearing program or data

Micro Disc Technical Specifications

Formatted Capacity	160K bytes per side (double density as standard)
No. of Tracks	40 (80 available as option at a future date)
No. of Sectors	16
Bytes per Sector	256
Transfer Rate	250K Bits/Sec

Supports up to 599 files per side, four drives single or double sided, 40 or 80 track. User definable configuration allows mixing of drive types including 5 ¼" (five and a quarter inch)
Extensive wild card facilities
Copy allows merging of basic and machine code files

Utilities

The Utilities are as follows:

1. Backup	Copy a whole disc
2. Copy	Copy a file to another
3. Del	Delete a file allowing wildcards
4. Dir	Display directory listing
5. Drv	Set the default drive number
6. Format	Format and initialise a disc
7. Load	Load a file (code data or basic)
8. Protect	Change protect status of file
9. Recall	Recall a basic array from a file
10. Ren	Rename a file
11. Save	Save a file (code, data or basic)
12. Store	Store a basic array as a data file
13. Sys	Change system configuration

Prices and data correct at time of going to press.
Specifications on the above models may change without notice.

Available at Allders, Currys, Dixons, Greens, Harrods, Laskys, Rumbelows, Spectrum and Zappo Computer Centres.



ORIC

(listing 2 continued from page 105)

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28940 : 7F EF B1 7F EF 10 25 00 AF 7F 4F0
28950 : 7E A6 7E 7E 9D 1F 23 D6 7F 4F 403
28960 : 27 12 A6 A9 00 BF 27 0C B6 7F 37F
28970 : 32 26 07 B6 AA B7 7F 33 20 05 31D
28980 : B6 FF B7 7F 33 A6 A9 00 03 27 467
28990 : 58 A6 A4 81 02 22 52 81 01 27 342
29000 : 18 30 89 FF FF A6 A9 00 03 81 4A2
29010 : 01 26 04 B6 03 20 06 81 02 27 184
29020 : 02 B6 01 20 04 A6 A9 00 03 C6 2C5
29030 : 18 3D C3 7F 60 1F 02 5F 7F 7F 375
29040 : EF A6 A0 B4 7F 33 AA 84 A7 B0 5F0
29050 : 5C C1 03 25 F2 30 89 00 1D 7C 389
29060 : 7F EF F6 7F EF C1 08 27 03 5F 524
29070 : 20 E1 30 89 FF 00 1F 32 39 10 353
29080 : BE 7F C0 EC 89 17 E0 ED 89 FF 6AE
29090 : E0 EC 89 19 00 ED 89 01 00 EC 4D1
29100 : A1 B4 7F 33 F4 7F 33 ED B4 30 54E
29110 : 89 00 20 10 BC 7F D0 25 EC 30 3D5
29120 : 89 FF 00 39 BE 7F F8 10 BE 7E 4E5
29130 : 9F 30 89 FF FD BF 7E 30 31 A9 59B
29140 : 00 01 BD 68 C4 BF 7E 2E A6 A9 4A4
29150 : 00 03 10 27 00 E2 4C A7 A9 00 2B0
29160 : 03 81 04 10 25 00 91 6F A9 00 266
29170 : 03 E6 A4 C1 02 10 22 00 90 C1 3D3
29180 : 01 27 3F 5F A6 89 18 01 A7 89 33E
29190 : 00 01 30 B9 00 20 5C C1 08 25 224
29200 : EF 30 89 FE FF BF 7E 2E 34 10 554
29210 : BE 7E 30 6A 89 FF FF 35 10 BC 52E
29220 : 0C 1F 27 03 7E 72 B6 B6 55 A7 34D
29230 : 84 30 89 00 20 BF 7E 2E 7E 74 3BA
29240 : B6 1F E7 84 20 48 30 89 00 01 332
29250 : 5F A6 B9 17 FF A7 89 FF FF 30 602
29260 : 89 00 20 5C C1 08 25 EF 30 89 39B
29270 : FF 00 BF 7E 2E 34 10 BE 7E 30 41A
29280 : 6C 89 FF FF 35 10 BC 0C 40 27 437
29290 : 03 7E 72 B6 B6 55 A7 89 01 00 385
29300 : 7E 74 95 BF 7E 2E BE 7E 30 5F 4BD
29310 : E7 B4 E6 A4 C1 02 22 05 BE 7E 51B
29320 : 2E 20 27 BE 7E 30 A6 84 E6 A4 495
29330 : C1 03 27 0F 4C A7 84 BE 7E 2E 3DB
29340 : 30 B9 00 20 BF 7E 2E 20 0D 4A 2BB
29350 : A7 84 BE 7E 2E 30 A9 FF E0 BF 5EC
29360 : 7E 2E 34 20 BD 71 1B 35 20 BE 35C
29370 : 7E 30 BC 7F F2 10 26 FF 0B 7E 466
29380 : 7E 9D A6 A9 FF F7 27 67 4F E6 623
29390 : A4 C1 02 27 1F C1 03 27 32 C1 3BB
29400 : 04 27 41 E6 B9 00 22 C4 C0 C1 442
29410 : 40 27 4A E6 89 00 A2 C4 C0 C1 507
29420 : 40 27 40 7E 71 E4 E6 89 00 5F 44B
29430 : C4 03 C1 01 27 33 E6 89 00 9F 3F1
29440 : C4 03 C1 01 27 29 7E 71 E4 E6 492
29450 : 89 FF E0 C1 55 27 1E E6 89 FF 631
29460 : E1 C1 55 27 16 7E 71 E4 E6 B9 576
29470 : 01 00 C1 55 27 0B E6 89 01 01 2BA
29480 : C1 55 27 03 7E 71 E4 6F A9 FF 52A
29490 : F7 34 30 1F 13 7F 7E FD B6 7F 4BC
29500 : 4E 01 02 25 10 6C A9 00 BC A6 34D
29510 : A9 00 BC 81 02 25 04 6F A9 00 2F9
29520 : BC A6 A9 00 BC 10 27 00 99 7C 3B3
29530 : 7E FD BE 7E 30 A6 84 1F 31 B1 512
29540 : 7F FD 22 4D B1 7F FD 26 07 B6 4F5
29550 : 7E FD 10 26 00 7E A6 A9 00 BF 40B
29560 : 26 3F EC B9 01 00 B1 55 27 1F 2F7
29570 : C1 55 27 1B B6 04 A7 A4 6C A9 442
29580 : 00 03 35 30 BE 7E 30 6C B4 1F 2E3
29590 : 31 30 89 00 20 BF 7E 2E 7E 72 365
29600 : B2 B6 7E FD 26 4C B6 03 A7 A4 529
29610 : A7 A9 FF F7 35 30 7E 72 B2 A6 5F3
29620 : A9 00 BF 26 C1 EC B9 FF E0 B1 5F4
29630 : 55 27 1F C1 55 27 1B B6 03 A7 323
29640 : A4 6C A9 00 03 35 30 BE 7E 30 3B0
29650 : 6A B4 1F 31 30 89 FF E0 BF 7E 513
29660 : 2E 7E 72 B2 D6 7E FD 26 0D B6 4BA
29670 : 04 A7 A4 A7 A9 FF F7 35 30 7E 578
29680 : 72 B2 BE 7E 30 A6 89 FF FF 1F 5DC
29690 : 31 B1 7F FA 22 49 B1 7F FA 26 516
29700 : 07 B6 7E FD 10 27 FF 50 A6 A9 50D
29710 : 00 BF 26 3D A6 89 00 22 B4 C0 3B7
29720 : B1 40 27 19 A6 89 00 A2 B4 C0 416
29730 : B1 40 27 0F B6 01 A7 A4 6C A9 3DE
29740 : 00 03 35 30 1F 31 7E 72 B2 B6 310
29750 : 7E FD 10 27 FF 20 B6 02 A7 A4 4A4
29760 : A7 A9 FF F7 35 30 7E 72 B2 A6 5F3
29770 : A9 00 BF 26 C3 A6 89 00 1F B4 3F3
29780 : 03 B1 01 27 19 A6 B9 00 9F B4 317
29790 : 03 B1 01 27 0F B6 02 A7 A4 6C 2FA
29800 : A9 00 03 35 30 1F 31 7E 72 B2 303
29810 : B6 7E FD 10 27 FE E3 B6 01 A7 577
29820 : A4 A7 A9 FF F7 35 30 7E 72 B2 5F1
29830 : BE 7E 30 C6 1F E7 89 FF FF BE 67D
29840 : 7E 2E 7E 72 B6 30 89 FF E0 BF 579
29850 : 7E 2E BE 7E 30 6F 89 FF FF BE 5CC
29860 : 7E 2E 7E 72 B6 B6 7F 2B B1 01 404
29870 : 26 08 B6 7C CA 26 03 BD 7A F2 47C
29880 : 7E 74 C1 BD 7F E9 BD 7E 2B 10 54E
29890 : BE 7F FB BE 7E A2 7F 7F 33 B6 59A
29900 : 7F FA C6 04 3D B6 7F FD B1 02 535
29910 : 27 09 B1 02 22 0B FB 7F FE 20 375
29920 : 03 F0 7F FE F7 7E 2A 30 B9 00 4CB
29930 : 01 A6 A4 B1 7F FB 25 09 B0 7F 4D3
29940 : FB B1 06 25 09 20 35 BB 06 B1 347
29950 : 7F FB 25 2E A6 A9 FF FF C6 04 5E4
29960 : 3D A6 B9 FF FD B1 02 27 0B B1 49B
29970 : 02 22 06 EB B4 20 02 E0 B4 F1 410
29980 : 7E 2A 25 09 F0 7E 2A C1 06 25 35A
29990 : 1C 20 07 CB 06 F1 7E 2A 24 13 2E4
30000 : 7C 7F 33 31 A9 FF FD B6 7F 33 56C
30010 : B1 03 10 25 FF A7 7E 6B 13 A6 3FE
30020 : B9 00 BC 10 27 00 5F 4F A7 B4 325
30030 : A7 B9 00 BC A6 A4 B1 2B 24 04 3D7
30040 : B6 49 20 02 B6 15 A7 A4 B6 0F 36C
30050 : A7 A9 FF FF BD 75 94 BE 06 C0 66B
30060 : EC B9 1B 00 ED 01 BC 12 00 25 3BE
30070 : F5 7E 6B 22 00 B9 18 01 ED B9 415
30080 : 00 01 7C 7F 07 D6 7F 07 30 B9 2FB
30090 : 00 20 B1 08 25 E2 35 10 1F 32 246
30100 : B6 7F 4D 4D B7 7F 4D 06 64 34 46B
30110 : 30 BD 7F E9 BD 7E 27 35 30 39 455
30120 : 75 30 7F 7F 07 BE 7F FB 7F 7F 4B0
30130 : 4F BD 6B C4 B6 7F FD B1 02 26 513
30140 : 04 30 B9 FF FF 4F 10 AE B9 00 451
30150 : C0 10 AF B9 00 E0 10 AE B9 00 42F
30160 : C2 10 AF B9 00 E2 30 B9 FF E0 5B4
30170 : 4C B1 07 25 E3 10 BD 65 93 7E 41F
30180 : 75 F3 B9 00 E0 10 AE 09 10 E2 512
30190 : 10 AF B9 00 E2 30 B9 00 E0 34 3F7
30200 : 10 BD 7E 24 35 10 7C 7F 07 B6 36C
30210 : 7F 07 B1 08 25 B9 BE 00 00 10 2BB
30220 : BE 00 00 31 A9 00 01 10 BC 9C 2A1
30230 : 40 25 F6 30 89 00 01 BC 00 01 2A2
30240 : 25 E9 7F 7F 2A 7A 7F 53 B6 7F 4B3
30250 : 53 27 03 7E 66 F8 5F BE 24 41 3AD
30260 : 10 BE 0C 49 BD 76 B5 BE 06 12 351
30270 : BD 76 77 BE 24 41 BD 76 B5 BE 4E3
30280 : 7E 5F BD 76 A7 BE 24 41 BD 76 4DD
30290 : B5 BE 0C 29 BD 76 A1 BE 0C E9 45F
30300 : BD 76 61 20 0E 10 BE 00 00 4F 2AF
30310 : 10 AF B1 4C B1 07 25 F8 39 BD 427
30320 : BB E5 27 FB 7E 76 CB 5F 5C BD 5F9
30330 : 76 B5 30 89 00 01 C1 05 25 F4 394
30340 : 39 7F 7F 33 A6 B4 A7 A4 7C 7F 40A
30350 : 33 B6 7F 33 30 89 00 20 31 A9 34E
30360 : 00 20 B1 05 25 EA 30 B9 FF 60 3CD
30370 : 31 A9 FF 61 39 5F 5C BD 76 B1 512
30380 : C1 05 25 F8 39 7F 7F 33 A6 B0 473
30390 : A7 A4 .7C 7F 33 B6 7F 33 31 A9 4BB
30400 : 00 20 B1 05 25 EE 31 A9 FF 61 3F3
30410 : 39 B6 7F 2B B1 7E 20 22 2A B1 3E5
30420 : 7E 20 25 22 B6 7F 2A B1 7E 1F 392
30430 : 22 1D B1 7E 1F 25 15 B6 7F 29 325
30440 : B1 7E 1E 22 10 B1 7E 1E 25 0B 2F9
30450 : B6 7F 28 B1 7E 1D 22 03 7E 77 3C3
30460 : 92 B7 FF C4 B6 FF 22 B4 0F B7 62D
30470 : FF 22 B7 FF C0 B7 FF C6 BD BA 792
30480 : 77 B6 AF 1F 89 BD 77 1A 20 27 3E9
30490 : BE 04 40 ED B1 BC 04 A0 25 F9 44E
30500 : BE 05 40 ED B1 BC 05 60 25 F9 450
30510 : BE 04 40 A7 B4 A7 B9 00 1F 30 37C
30520 : B9 00 20 BC 05 40 25 F1 39 BE 357
30530 : 04 B2 BF 00 B0 BE 7D FD BD 90 522
30540 : E5 BE 05 04 BF 00 BB BE 7D E4 482
30550 : BD 90 E5 7F 7F 07 BD BB E5 27 5BB
30560 : FB B7 7F 33 CC 7D E2 FB 7F 07 610
30570 : 7C 7F 07 1F 01 B3 7B CA 1F 02 30B
30580 : B6 7F 33 A7 B4 A7 A4 B6 7F 07 51A
30590 : B1 03 25 BA 10 BE 7E 1C BE 7F 3CB
30600 : 27 A6 B0 A7 A0 BC 7F 2C 25 F7 4E7
30610 : BD BA 77 B6 9F 1F 89 BD 77 1A 509
30620 : BE 04 B4 BF 00 BB BE 7D C7 BD 4EC
30630 : 90 E5 BE 7F 27 10 BE 04 93 BD 49B
30640 : 77 CA BE 05 04 BF 00 BB BE 7E 42B
30650 : 0B BD 90 E5 BE 7E 1C 10 BE 05 40B
30660 : 13 BD 77 CA 20 11 5F A6 B0 BB 452
30670 : 70 A7 A4 31 A9 FF FF 5C C1 05 5B5
30680 : 25 F1 39 B6 42 B7 05 15 B6 59 3C7
30690 : B7 05 1A 10 BE 05 1B BE 7D E2 37A
30700 : A6 B0 A7 A0 10 BC 05 1B 25 F6 444
30710 : BE 7D AA BD 7D BF BE 05 A7 BF 577
30720 : 00 BB BE 7D 95 BD 90 E5 BD BB 5D2
30730 : E5 27 FB B1 4E 26 01 39 7E 66 41A
30740 : 00 B6 7F FD B1 01 27 16 B1 02 374
30750 : 26 22 A6 B9 00 5E B1 01 26 1A 297
30760 : 6F B9 00 5E 6F B9 00 7E 20 10 2FC
30770 : A6 B9 00 63 B1 40 26 08 AF B9 379
30780 : 00 63 6F B9 00 B3 34 30 BD 7F 37E
30790 : EC B6 05 BD 7F E9 35 30 7A 7F 4FA
30800 : 57 39 7F 7E FB BD 7B 97 BE 1E 500
30810 : 00 10 BE 06 00 CC 00 00 BD 7B 2A5
30820 : B2 7F 7E 2A 7F 7F 4F BD 7B 97 4F2
30830 : BD 7B C0 7C 7E 2A D6 7E 2A B1 4FB
30840 : 04 25 F0 B6 7F 4E B4 01 4C 01 3EE
30850 : 01 26 03 7E 79 52 BD 7C 22 10 2BE
30860 : BE 1E 00 CC 00 00 BD 7B B2 20 37F
30870 : 50 10 BE 00 00 BE 00 00 30 B9 235
30880 : 00 01 BC 27 10 25 F7 31 A9 00 2BA
30890 : 01 10 BC 00 03 25 EA 39 EE B1 357
30900 : EF A1 C3 00 02 10 B3 0C 00 25 319
30910 : F3 39 7C 7E FB BE 06 00 B6 7E 4E9
30920 : FB B4 01 B1 01 26 0C EC B4 48 3EC
30930 : 5D ED B1 BC 12 00 25 F5 39 EC 4A3
30940 : B4 44 54 ED B1 BC 12 00 25 F5 442
30950 : 39 7C 7F 4E BE 24 2F 10 BE 7E 37F
30960 : A7 EC A1 ED B4 30 B9 00 20 10 4BE
30970 : BC 7E B6 25 F2 B6 7F 4E B1 07 4E2
30980 : 25 02 B6 04 C6 0A 3D C3 7E A3 3A2
30990 : 1F 02 BD 79 16 7E 7D 93 BE 1B 3A4
31000 : 2A BD 79 3B BE 1B 34 BD 79 3B 3E9
31010 : BE 13 2A BD 79 3B BE 13 34 BD 3CE
31020 : 79 3B BE 19 A1 BD 79 3B BE 19 414
31030 : BD BD 79 3B 39 30 B9 0C 40 4F 3BB
31040 : EE A1 EF B4 30 B9 00 20 4C 01 4AB
31050 : 05 25 F3 31 A9 FF F6 39 10 BE 4C3
31060 : 7D 7F BD 79 16 BE 14 A1 BD 79 4C1
31070 : 3B BE 14 BD BD 79 3B 4F 10 BE 3FB
31080 : 00 00 BE 24 1F 10 AF B4 30 B9 2CD
31090 : 00 20 4C B1 08 25 F4 7F 7F FE 40A
31100 : B6 3D B7 7F FB B6 0F B7 7F FA 5B9
31110 : BE 1E 00 10 BE 06 00 EC B1 ED 3AA
31120 : A1 10 BC 12 00 25 F6 BE 0B AF 3D4
31130 : BD 60 C4 B6 01 B7 7D 92 10 BE 4D4
31140 : 7D 77 A7 A0 10 BC 7D 7F 25 FB 4F0
31150 : 4F F6 7E A4 FB 7E A2 C3 7D 76 63B
31160 : 1F 01 B6 02 A7 B4 7F 7C 9E BD 479
31170 : 7C 6F 12 12 12 BE 7F FB BD 6B 44E
31180 : C4 BF 7E 30 10 BE 7D 76 BE 0F 45F
31190 : 2A BD 7A 55 BE 0F 34 BD 7A 55 413
31200 : BE 07 2A BD 7A 55 BE 07 34 BD 3D1
31210 : 7A 55 BE 0D A1 BD 7A 55 BE 0D 432
31220 : BD BD 7A 55 BE 0B A1 BD 7A 55 50C
31230 : BE 0B BD BD 7A 55 10 BE 00 00 37D
31240 : 31 A9 00 01 10 BC 00 64 25 FA 2F6
31250 : 7C 7C A1 B6 7C A1 B1 0F 25 31 452
31260 : 7F 7C A1 7C 7C A2 F6 7C A2 C1 60B
31270 : 1D 25 04 7F 7C A2 5F 4F C3 7D 3D1
31280 : AA 1F 02 B6 3F B7 FF 23 C6 1E 44D
31290 : 7F FF 20 73 FF 20 A6 A4 4A 26 4EA
31300 : FD 5A 26 F5 B6 37 B7 FF 23 B6 3BE
31310 : 7C 9E 26 33 7E AB 13 31 A9 00 346
31320 : 01 BC 7E 30 27 01 39 A6 A4 26 33C
31330 : 01 39 B1 02 26 04 B7 7C 9E 39 2F1
31340 : 7C 7C 9F 4F A7 A4 34 20 BD 7F 4C1
31350 : 50 10 BE 7E 30 31 A9 00 20 BD 3B3
31360 : 6B B2 35 20 39 B6 FF 7E 7B CA 513
31370 : 7E 7B 00 B6 3F B7 FF 23 C6 3C 51E
31380 : 7F FF 20 A6 B0 27 11 BD 7A A0 4D3
31390 : 20 F2 73 FF 20 A6 B4 4A 26 FD 53B
31400 : 5A 26 F5 39 B6 37 B7 FF 23 39 47D
31410 : B6 3F B7 FF 23 C6 0A 7F FF 20 50C
31420 : 73 FF 20 B6 32 4A 26 FD 5A 26 437
31430 : F5 B6 37 B7 FF 23 39 00 00 00 3C4
31440 : 00 00 00 00 00 00 00 00 00 00 0
31450 : 00 00 00 00 00 00 00 B6 0D A7 13A
31460 : B4 B6 09 A7 A4 B6 00 A7 B4 B6 49D
31470 : 10 7E 7B 03 7C 7C CA 7C 7F 53 41C
31480 : BD 7E 9A 4F BD 7F E9 BD 7E 2D 5AF
31490 : 39 A7 A4 4F C6 09 E7 B4 A7 A4 55B
31500 : 39 BE 7E 30 BF 7C A0 B6 3F B7 4FC
31510 : FF 23 7F 7E 31 7F FF 20 B7 7E 523
31520 : 30 C6 32 BD 7B 3C 7C 7E 31 B6 47D
31530 : 7E 31 B1 03 25 F1 B6 37 B7 FF 4BC
31540 : 23 BE 7C A0 BF 7E 30 39 73 FF 515
31550 : 20 7A 7E 30 B6 7E 30 4A 26 FD 419
31560 : 5A 26 F1 B6 96 B7 7E 30 39 0B 433
31570 : 25 E9 39 B6 3F B7 FF 23 7F FF 563
31580 : 20 B6 96 73 FF 20 1F B9 5A 26 3F6
31590 : FD 4A 26 F5 B6 37 B7 FF 23 39 531
31600 : B6 3F B7 FF 23 7F FF 20 7F 7E 539
31610 : 30 7C 7E 30 C6 FA 73 FF 20 B6 562
31620 : 7E 30 4A 26 FD 7C 7E 30 5A 26 3C5
31630 : F1 B6 37 B7 FF 23 39 B6 3F B7 53C
31640 : FF 23 C6 FA B6 01 B7 7E 30 7C 54A
31650 : 7E 30 B6 7E 30 5A BD 7B C3 C1 52B
31660 : 01 22 F2 7A 7E 30 B6 7E 30 5C 3FD
31670 : BD 7B C3 C1 FA 25 F2 B6 37 B7 641
31680 : FF 23 39 73 FF 20 4A 26 FD 39 493
31690 : B7 7F 33 BE 7E 30 BD 71 97 BD 557
31700 : 7D 71 7F 7D 92 BD 7B 97 B6 64 532
31710 : F6 7C 9F 5B 30 1F 01 30 B9 FF 47E
31720 : CE BC 00 00 20 13 B6 01 B7 7F 355
31730 : 4D B6 32 34 10 BD 7F E9 BD 7C 4A7
31740 : 07 35 10 20 E4 BD 7B 97 7E 7B 412
31750 : BB B6 3F B7 FF 23 C6 FA 7F FF 664
31760 : 20 73 FF 20 1F 9B 4A 26 FD 5A 430
31770 : 26 F5 BA 37 B7 FF 23 39 7F 7C 4E5
31780 : 9F BE 2A 00 39 B6 3F B7 FF 23 42E
31790 : 7F FF 20 7F 7C 9D C6 32 73 FF 5A0
31800 : 20 B6 96 4A 26 FD 5A 26 F5 C6 4E4
31810 : 32 73 FF 20 B6 32 4A 26 FD 5A 443
31820 : 26 F5 B6 7C 9D 4C B7 7C 9D B1 5B7
31830 : 19 25 DB B6 37 B7 FF 23 39 5F 447
31840 : 5C C1 05 24 09 34 04 BD 7C 07 2C7
31850 : 35 04 20 F2 39 4F BD 7F E9 BD 4B5
31860 : 7E 9A BE 7C A6 39 B6 00 00 00 3B7
31870 : 00 FF FF FF FF FF FF FF FF FF BF7
31880 : FF FF FF FF FF FF FF FF FF FF 9F6
31890 : FF FF FF FF FF FF FF FF FF FF 9F6
31900 : FF 19 02 00 7F F2 16 39 FF FF 4BB
31910 : 7D B7 7D 91 B4 91 CD 7D 73 6E 5B2
31920 : 73 6E 7D 73 7D 73 B7 7D B7 91 4BD
31930 : B7 7D B2 BC 96 AA A0 AA B4 AF 5FF
31940 : BE CB DC F0 FA 00 00 7E 6D DB 612
31950 : 4D 45 59 42 4F 41 52 44 20 4F 2C0
31960 : 52 20 4A 4F 59 53 54 49 43 4B 2E2
31970 : 20 4B 2F 4A BF 00 B1 B3 B2 BA 3B3
31980 : B3 B3 B5 B1 B3 B3 BF BF BA BD 547
31990 : BF BE B5 B1 B3 B2 BA BD BF BA 55B
32000 : B4 BC BB BA BC BC B5 B5 BF BF 562
32010 : BF BF BA BB BC B7 B5 B4 BC BB 563
32020 : BA BB BD BA B5 BF BF BA BF BF 577
32030 : B5 B5 BF BF BF BF BA BF BF BF 57D
32040 : B5 B5 BF BA BA BF BD B0 B5 BF 563
32050 : BF BA BF BF B5 B4 BC BC BF BF 576
32060 : BA BF BF BF B5 B5 BF BA BA BF 573
32070 : BF BA 00 54 4F 4D 20 46 2E 41 2DE
32080 : 2E 20 46 49 45 52 53 20 31 39 251
32090 : 38 33 20 42 45 4C 47 49 55 4D 290
32100 : BF 00 52 45 56 45 4E 47 45 20 2BB
32110 : 4F 46 00 7E 7C 29 7E 79 BE 01 36E
32120 : 01 01 01 01 02 01 00 00 00 2A 31
32130 : AB 20 0B 23 CB 23 CB 20 0B 2A 2F0
32140 : AB 00 00 7E 7A BD 00 7E 66 CF 3E0
32150 : 41 4E 4F 54 48 45 52 20 47 41 289
32160 : 4D 45 20 20 59 2F 4E 29 00 00 1D9
32170 : 6F 69 45 11 BD 95 06 6B 36 35 32C
32180 : 47 5B 75 64 1A 4D 69 77 63 69 38E
32190 : 03 72 94 50 2B 27 B5 94 5B 00 319
32200 : 59 4F 55 20 53 43 4F 52 45 44 2DD
32210 : 20 30 30 30 30 30 20 50 4F 49 21B
32220 : 4E 54 53 2E 00 00 54 4F 4D 45 25B
32230 : 4E 54 45 52 20 59 4F 55 52 20 2CB
32240 : 49 4E 49 54 49 41 4C 53 3A 20 2B7
32250 : 2E 2E 2E 00 59 4F 55 20 42 52 23B
32260 : 4F 4B 45 20 54 48 45 20 48 49 291
32270 : 47 48 20 53 43 4F 52 45 20 21 26C
32280 : 21 21 00 00 00 00 00 00 00 7E C0
32290 : 66 FB BD 65 DB 7E 7B 55 72 7E 596
32300 : 7C 07 07 22 00 E0 04 14 04 04 1AC
32310 : 04 55 01 55 40 55 55 01 15 01 1B0
32320 : 55 10 40 44 55 04 55 40 55 01 22D
32330 : 55 55 40 55 41 55 55 01 04 10 23F
32340 : 40 55 41 55 41 55 55 41 55 01 2AD
32350 : 55 55 41 41 41 55 10 10 10 10 202
32360 : 05 45 44 45 44 05 51 01 41 01 1B0
32370 : 51 54 04 50 04 04 55 40 54 40 22A
32380 : 55 15 10 15 10 10 45 44 44 44 1C0
32390 : 45 41 10 10 10 40 01 44 10 10 15B
32400 : 10 04 04 04 00 04 00 00 00 00 20
32410 : 7E 6D 25 7E 74 A9 04 04 01 03 2B7
32420 : 03 03 02 40 B1 45 01 41 01 4E 19F
32430 : C1 7B B1 6E 21 7B B1 4E A1 02 499
32440 : 40 AA AA B2 B2 AA AA B2 B2 23 513
32450 : CB 2B 2B 23 CB 23 CB 2B 2B 20 35E
32460 : 00 BB 00 BA AA BB 0A 20 00 02 270
32470 : B0 BC 32 A0 0A BC 32 02 B0 2A 352
32480 : AB 23 CB 0C 30 32 BC 0A A0 00 337
32490 : 00 7E 70 D3 B1 06 7E 65 C2 FD 4EA
32500 : 31 A9 FF F4 39 00 00 04 00 00 30A
32510 : 04 0B 6E 7E 7B 70 7E 7B 95 0B 37C
32520 : 01 02 B0 0B 20 20 0B 20 0B 0B 103
32530 : 20 02 B0 00 00 02 B0 0A A0 0A 1DB
32540 : A0 02 B0 00 00 15 00 00 01 00 13B
32550 : 00 00 0B 07 01 00 01 01 00 00 12
32560 : 00 00 00 05 DA 01 00 00 01 00 E1
32570 : 00 00 00 FE 7E 69 01 7E 6A C5 393
32580 : 7E 6B F0 7E 6C BE 39 D6 7A 01 4DB
32590 : 01 00 7E 7B 00 00 7E 7B 52 26 275
32600 : 0A A0 2B AB AA AA A0 00 A0 00 40E
32610 : AA AA 2A AB 0A A0 0A A0 2A 2B 3CC
32620 : AA AA 00 0A 00 0A AA AA 2A AB 3BE
32630 : 0A A0 03 FC 00 0F FF 00 3C F3 3E6
32640 : C0 3F FF C0 3F FF C0 3C 03 C0 5BB
32650 : 3F FF C0 3F FF C0 00 FF 00 03 4FE
32660 : FF C0 0F 3C F0 0F FF F0 0F FF 606
32670 : F0 0F 00 F0 0F FF F0 0F FF F0 5EB
32680 : 00 3F C0 00 FF F0 03 CF 3C 03 3FF
32690 : FF FC 03 FF FC 03 C0 3C 03 FF 5FA
32700 : FC 03 FF FC 0F F0 3F FC F3 CF 6F6
32710 : FF FF FF FF F0 0F FF FF FF FF BF7
32720 : 2B 2B BE BE 2B 2B BE BE 2B 01 3C1
32730 : 7E AE B4 39 01 01 39 07 F4 7E 35D
32740 : 6B BB 7E 6E 04 7E 6D B3 7E 7A 47C
32750 : B2 0B 00 02 09 00 14 10 00 14 FD
```

Listing 1.

```
10 REM ** MACHINE CODE LOADER **
20 FOR I=#A000 TO #A64C
30 READJ
40 POKEI,J
50 NEXTI
60 END
1000 DATA160,0,185,40,160,153,32,185
1010 DATA200,192,24,208,245,169,0,168
1020 DATA153,0,4,200,192,6,208,248
1030 DATA169,0,141,6,4,169,10,141
1040 DATA106,2,32,64,160,76,28,161
1050 DATA0,12,30,63,63,30,12,0
1060 DATA31,63,63,0,0,0,0,0
1070 DATA62,63,63,0,0,0,0,0
1080 DATA169,128,133,64,169,187,133,65
1090 DATA169,0,133,66,169,167,133,67
1100 DATA160,0,177,66,145,64,24,165
1110 DATA66,105,1,133,66,165,67,105
1120 DATA0,133,67,24,165,64,105,1
1130 DATA133,64,165,65,105,0,133,65
1140 DATA165,64,201,224,208,220,165,65
1150 DATA201,191,208,214,32,128,160,96
1160 DATA160,5,162,0,185,0,4,24
1170 DATA105,48,157,137,187,136,232,224
1180 DATA6,208,241,173,6,4,24,105
1190 DATA48,141,166,187,96,169,0,168
1200 DATA153,0,4,200,192,6,208,248
1210 DATA169,5,141,6,4,169,20,141
1220 DATA7,4,32,64,160,169,1,32
1230 DATA44,162,169,216,141,11,4,174
1240 DATA7,4,202,224,5,208,1,232
1250 DATA142,7,4,169,19,141,8,4
1260 DATA169,26,141,9,4,172,118,2
1270 DATA185,216,192,48,8,169,1,141
1280 DATA12,4,76,234,160,169,7,141
1290 DATA12,4,234,173,118,2,48,8
1300 DATA169,10,141,10,4,76,253,160
1310 DATA169,32,141,10,4,32,117,161
1320 DATA32,189,163,173,11,4,240,95
1330 DATA201,255,240,91,238,13,4,172
1340 DATA7,4,162,0,232,208,253,136
1350 DATA208,250,240,225,160,0,185,64
1360 DATA161,153,189,189,200,192,13,208
1370 DATA245,160,0,185,77,161,153,204
1380 DATA190,200,192,26,208,245,173,8
1390 DATA2,201,132,208,249,76,157,160
1400 DATA7,8,71,65,77,69,32,79
1410 DATA86,69,82,9,3,7,8,80
1420 DATA82,69,83,83,32,39,83,80
1430 DATA65,67,69,39,32,84,79,32
1440 DATA83,84,65,82,84,9,3,206
1450 DATA7,4,240,3,76,178,160,238
1460 DATA7,4,76,178,160,174,8,4
1470 DATA173,8,2,201,172,240,31,201
1480 DATA188,240,39,201,157,240,46,169
1490 DATA37,142,8,4,160,27,32,209
1500 DATA161,169,35,232,32,209,161,169
1510 DATA38,232,32,209,161,96,32,189
1520 DATA161,202,224,2,176,1,232,76
1530 DATA135,161,32,189,161,232,224,38
1540 DATA144,245,202,208,242,173,8,2
1550 DATA201,186,208,249,96,160,27,138
```

ORIC SMASH



SMASH RUNS ON a 48K Oric-1 and is a version of the game where you have to knock all the bricks out of a wall; it includes two walls, five lives, a bonus ball for every 1,000 points, increasing difficulty, and on-screen scoring. It is written completely in machine-code and is located in RAM from address 40960 to 43872.

First, the machine-code should be entered by typing in, saving, and Running the machine-code loader. Then, the screen generating program — listing 2 — should also be typed in, saved, and Run. This program performs the task of printing the screen display and copying it into memory locations 42732 to 43872 where it will be accessed by the main program whenever a new screen is required. A line of possible interest to programmers is line 10, it permits the use of the full 28 lines on the screen.

At this point, both listings should have been entered and Run, which means that the game is finished!! So, to get it going, type

CALL40960;

if all runs successfully then press the reset button and type

CSAVE"SMASH",A40960,E43872,AUTO

The machine code will then run automatically on loading. If the computer crashes or the game does not work properly then reload and check the listings in turn, and when corrected, save the new versions and repeat the above procedure.

The keys used are cursor left to move left, cursor right to move right, P to pause, and C to continue after a pause.

If you feel that the game is at the wrong speed, then the initial speed — it gets faster after each screen — can be altered by typing

POKE41134,n

where n is an integer from 1 to 255 (the lower the number the faster the game.

```
1560 DATA72,169,32,32,209,161,232,32
1570 DATA209,161,232,32,209,161,104,170
1580 DATA96,133,64,134,65,132,66,152
1590 DATA72,169,128,133,67,169,187,133
1600 DATA68,164,65,198,66,48,16,24
1610 DATA165,67,105,40,133,67,165,68
1620 DATA105,0,133,68,76,227,161,165
1630 DATA64,145,67,104,168,96,134,65
1640 DATA132,66,152,72,169,187,133,68
1650 DATA169,128,133,67,164,65,198,66
1660 DATA48,16,24,165,67,105,40,133
1670 DATA67,165,68,105,0,133,68,76
1680 DATA14,162,177,67,133,64,104,168
1690 DATA165,64,96,96,201,2,240,5
1700 DATA160,0,76,55,162,160,21,185
1710 DATA212,162,201,255,240,237,32,128
1720 DATA162,200,185,212,162,72,10,10
1730 DATA144,7,72,169,1,141,232,2
1740 DATA104,162,2,142,225,2,162,1
1750 DATA142,229,2,141,231,2,162,0
1760 DATA142,226,2,142,227,2,142,228
1770 DATA2,142,230,2,152,72,32,33
1780 DATA244,104,168,104,133,64,232,208
1790 DATA253,198,64,208,249,200,208,183
1800 DATA132,80,133,64,24,101,64,133
1810 DATA65,169,0,105,0,133,66,165
1820 DATA65,24,101,64,133,67,165,66
1830 DATA105,0,133,68,169,1,141,225
1840 DATA2,169,0,141,229,2,141,228
1850 DATA2,165,64,141,227,2,32,30
1860 DATA244,165,65,141,227,2,165,66
1870 DATA141,228,2,238,225,2,32,30
1880 DATA244,165,67,141,227,2,165,68
1890 DATA141,228,2,238,225,2,32,30
1900 DATA244,164,80,96,100,80,100,80
1910 DATA100,80,90,112,100,60,90,108
1920 DATA80,80,90,80,80,116,67,100
1930 DATA255,50,200,60,210,80,110,70
1940 DATA100,100,100,50,100,200,250,255
1950 DATA1,80,0,3,1,80,95,5
1960 DATA1,128,0,3,1,128,128,5
1970 DATA1,128,95,5,1,0,95,7
1980 DATA1,0,0,1,0,80,0,4
1990 DATA0,128,0,4,0,0,0,0
2000 DATA3,35,0,1,3,37,0,1
2010 DATA3,38,0,1,3,0,95,5
2020 DATA3,128,0,1,3,128,128,7
2030 DATA3,128,95,7,3,0,0,3
2040 DATA4,0,0,4,4,37,0,7
2050 DATA4,35,0,0,4,38,0,1
2060 DATA5,0,0,5,5,0,95,3
2070 DATA5,37,0,7,5,35,0,7
2080 DATA5,38,0,7,5,128,0,7
2090 DATA5,128,128,1,5,128,95,1
2100 DATA7,0,0,7,7,80,0,5
2110 DATA7,80,95,3,7,128,0,5
2120 DATA7,128,128,3,7,128,95,3
2130 DATA7,0,95,1,7,0,128,1
2140 DATA5,0,128,3,3,0,128,5
2150 DATA1,0,128,7,3,38,95,7
2160 DATA3,0,37,4,5,37,95,1
2170 DATA5,35,95,1,5,0,38,4
2180 DATA5,0,128,3,7,0,128,1
2190 DATA3,35,95,7,255,173,13,4
2200 DATA41,1,208,1,96,174,10,4
2210 DATA172,9,4,169,16,32,209,161
2220 DATA173,12,4,32,105,164,160,0
2230 DATA185,248,162,132,83,205,12,4
2240 DATA208,99,201,255,240,29,200,185
2250 DATA248,162,32,36,165,197,80,208
2260 DATA84,200,185,248,162,32,75,165
2270 DATA197,81,208,73,200,185,248,162
2280 DATA141,12,4,10,168,185,112,165
2290 DATA133,64,185,113,165,133,65,173
2300 DATA10,4,24,101,64,141,10,4
2310 DATA173,9,4,24,101,65,141,9
2320 DATA4,174,10,4,172,9,4,192
2330 DATA27,240,34,32,254,161,201,24
2340 DATA176,10,201,17,144,6,56,233
2350 DATA16,32,128,165,169,36,32,209
2360 DATA161,32,47,166,96,164,83,200
2370 DATA200,200,200,208,139,206,6,4
2380 DATA32,128,160,173,6,4,208,8
2390 DATA169,2,32,44,162,76,28,161
2400 DATA174,8,4,32,189,161,76,203
2410 DATA160,201,0,240,38,201,1,240
2420 DATA50,201,3,240,68,201,4,240
2430 DATA86,201,5,240,101,136,32,254
2440 DATA161,133,80,32,22,165,200,202
2450 DATA32,254,161,133,81,32,22,165
2460 DATA76,245,164,136,32,254,161,133
2470 DATA80,32,22,165,169,32,133,81
2480 DATA76,245,164,136,32,254,161,133
2490 DATA80,32,22,165,200,232,32,254
2500 DATA161,133,81,32,22,165,76,245
2510 DATA164,200,32,254,161,133,80,32
2520 DATA22,165,136,232,32,254,161,133
2530 DATA81,32,22,165,76,245,164,200
2540 DATA32,254,161,133,80,32,22,165
2550 DATA169,32,133,81,32,22,165,76
2560 DATA245,164,200,32,254,161,133,80
2570 DATA32,22,165,136,202,32,254,161
2580 DATA133,81,32,22,165,165,80,201
2590 DATA24,176,10,201,17,144,6,56
2600 DATA233,16,32,128,165,165,81,201
2610 DATA24,176,10,201,17,144,6,56
2620 DATA233,16,32,128,165,96,201,24
2630 DATA176,9,201,17,144,5,169,16
2640 DATA32,209,161,96,72,165,80,201
2650 DATA24,176,10,201,17,144,6,169
2660 DATA128,133,80,104,96,201,17,176
2670 DATA6,169,0,133,80,104,96,201
2680 DATA32,208,6,169,0,133,80,104
2690 DATA96,104,96,72,165,81,201,24
2700 DATA176,10,201,17,144,6,169,128
2710 DATA133,81,104,96,201,17,176,6
2720 DATA169,0,133,81,104,96,201,32
2730 DATA208,223,169,0,133,81,104,96
2740 DATA0,255,1,255,0,0,1,1
2750 DATA0,1,255,1,0,0,255,255
2760 DATA133,70,173,3,4,133,71,173
2770 DATA0,4,24,101,70,201,10,144
2780 DATA122,56,233,10,141,0,4,173
2790 DATA1,4,105,0,201,10,144,113
2800 DATA169,0,141,1,4,173,2,4
2810 DATA105,0,201,10,144,105,169,0
2820 DATA141,2,4,173,3,4,105,0
2830 DATA201,10,144,97,169,0,141,3
2840 DATA4,173,4,4,105,0,201,10
2850 DATA144,89,169,0,141,4,4,173
2860 DATA5,4,105,0,201,10,144,81
2870 DATA169,0,141,5,4,165,71,205
2880 DATA3,4,240,21,173,7,4,201
2890 DATA9,240,14,152,72,138,72,32
2900 DATA199,250,104,170,104,168,238,6
2910 DATA4,152,72,138,72,32,128,160
2920 DATA32,250,250,104,170,104,168,206
2930 DATA11,4,96,141,0,4,76,221
2940 DATA165,141,1,4,76,221,165,141
2950 DATA2,4,76,221,165,141,3,4
2960 DATA76,221,165,141,4,4,76,221
2970 DATA165,141,5,4,76,221,165,165
2980 DATA80,166,81,201,35,240,17,201
2990 DATA38,240,13,201,37,240,9,224
3000 DATA95,240,5,201,80,240,1,96
3010 DATA32,16,251,96,0
```

There is always another brick in the wall in this fast machine code game written by Miles Dunlop.

Listing 2.

```
5 REM FOR "_" READ POUND
SIGN
10 POKE623,28:DOKE621,47960
15 PRINTCHR$(17)
20 CLS
30 E$=CHR$(27)
40 PRINTE$"H"E$"G SCORE
BALLS ";
50 PRINTE$"I"E$"CPPPPPPPPPP
PPPPPPPPPPPPPPPPPPPPPPPPPP";
60 FORI=1TO4:GOSUB10000:
   NEXT
70 C$="T":GOSUB20000
80 C$="U":GOSUB20000
90 C$="V":GOSUB20000
100 FORI=1TO3:GOSUB10000:
    NEXT
110 C$="V":GOSUB20000
120 C$="R":GOSUB20000
130 C$="Q":GOSUB20000
140 FORI=1TO12:GOSUB10000
    :NEXT
150 PRINTE$"I"E$"G";
160 B=#A700
170 FORA=#BB80TO#BFE0
180 POKEB,PEEK(A)
185 B=B+1
190 NEXTA
195 PRINTCHR$(17)
200 END
10000 PRINTE$"I"E$"C_
      _";:RETURN
20000 PRINTE$"I"E$"C_";
20010 FORI=1TO36:PRINTE$C$;
      :NEXTI
20020 PRINT"_";
20030 RETURN
```



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s held
ve by the
gorilla.
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onnecting
rs and move
the gangways.
orilla will be
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ils at you! The only
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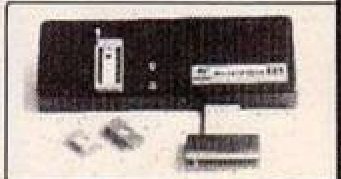
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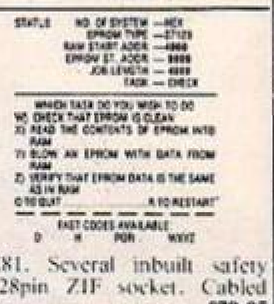
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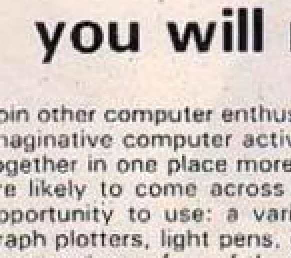
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BUGS

Les Ellingham, an Atari and multifarious creepy crawlies go harvesting.

BUGS IS A SIMPLE game which I hope will show that some good games can be written for your Atari even if you do not understand some of the more advanced programming techniques. No player-missile graphics, no VBI routines, all of the action is achieved by Pokes to the screen. By level 9 the action gets quite fast.

You play the part of a ladybird who has to harvest a whole host of aphids by collecting them into one of four 'nests' on each side of the screen. Dotted around the place are several mushroom looking things which, if you touch them, will hatch out into more aphids. These are poisonous to a degree and will sap your strength but strength can be made up by pushing the aphids right into the nests and killing them. There are some aphids which are deadly — the orange ones — and touching these will mean instant death. These will multiply if you are not quick enough in collecting the green aphids. If your strength falls to zero, you die and you must have a certain strength ratio to progress to the next level.

In order to achieve the maximum speed possible in Basic, the main game loop has been kept short and all routines which may be needed during the course of play are at the beginning of the program. Routines which are used only once or infrequently are put at the end of the program.

Line 10 sends the program immediately to the initialisation and titles.

Line 20 is a simple delay loop with the variable DL set at different points in the program. By putting this loop at the beginning of the program more accurate timing can be achieved.

Lines 30-50 maintain the score. The variable SC keeps track of the points scored by killing aphids less points deducted for hatching them out. CSC is the maximum score at any one point during the game and Score is only updated if the points gained exceed the maximum so far.

Thus hatching an aphid puts you back a number of points and you must kill more to get to a stage where you can increase your score. STR is a measure of your strength and if this falls to 0 the program jumps to the death routine. Line 50 stops the 'attract' mode.

Lines 60-150 are the main subroutine to determine if the aphids you are collecting collide with anything. The variables M and M2 hold the next location to which the aphid will be pushed. If that location is a 'mushroom' then the routine jumps to line 150 which hatches out the mushroom and decreases your score. If the aphid is going to collide with anything else — line 70 — then we must determine if it is possible for the aphid to move aside.

Death routine reached

This is determined in lines 95-110 which search an array for all possible locations of escape. If none can be found, the program exits the loop to line 115 which kills the aphid by Poking the ladybird into the aphid's position. The score is increased in line 120 and this line also resets the timer and checks to see if all the bugs have been killed. If there is room for the aphid to escape then line 105 jumps out of the loop and returns to line 75 which places the aphid at the next available blank position.

Lines 200-255 are the main game loop. Line 200 reads the joystick and if it is not being used, moves your ladybird to a new position chosen randomly from the array MPOS. This line also contains a delay routine according to the level of the game.

Line 210 determines the position you are trying to move to if the joystick is active and the following lines determine if something is in that position.

Line 240 contains a delay loop to set the action at a speed commensurate with current level and line 245 moves your ladybird to the next position.

Lines 500-580 determine bonuses and take you to the next level when all the bugs have been killed. Note that line 500 will skip the bonus and next level if you have failed to improve your score in a particular level. These lines are fairly simple and merely give you 5 bonus points for each remaining mushroom and then increase the level (LV).

Lines 600-665 are the death routine reached either by hitting the killer bug — line 230 — or by losing all your strength — line 45. Line 600 simply Pokes your position with all the characters available accompanied by some sound before going on to give an end of game message.

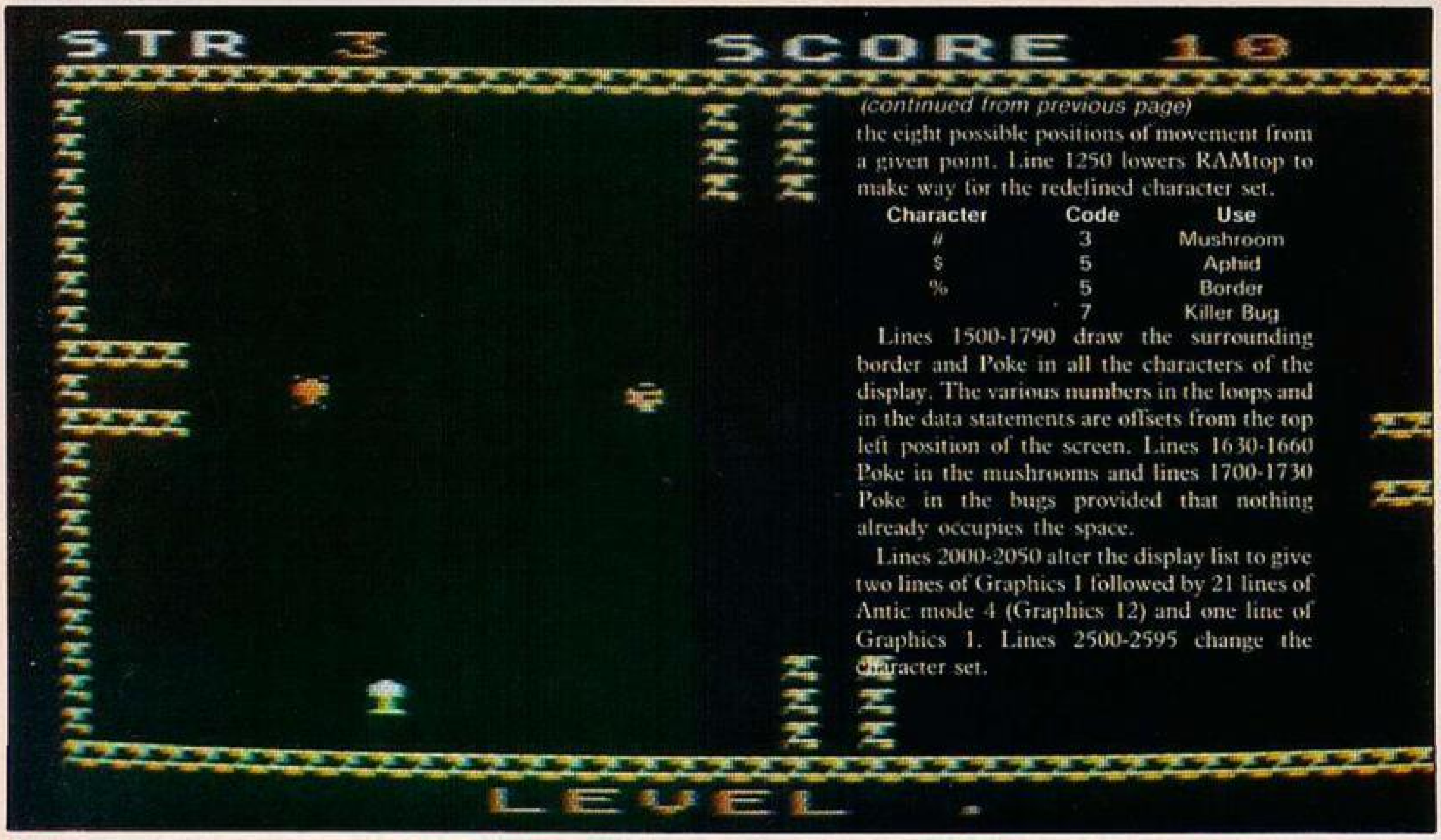
Lines 800-820 are the sounds used when an aphid is killed. Note that the routine is used in different ways by jumping to the beginning — line 530 — or entering part way through — line 115. By entering a subroutine at different points, one routine can serve several purposes.

Lines 900-930 add a new orange bug if a certain time has elapsed without killing an aphid — line 235. It simply Peeks the screen to find a blank position and then Pokes in the character representing the orange bug. If you want more killer bugs to appear reduce the figure 3 in line 235.

Lines 1000-1100 are the titles and options and are quite straightforward. Note again the sound subroutine being used at different points.

Lines 1200-1280 initialise things. The array ST holds the amount by which various positions of the joystick will move your character. By reading this array in line 210 much greater speed can be achieved than by using If . . . Then statements. MPOS holds

(continued on next page)



(continued from previous page)

the eight possible positions of movement from a given point. Line 1250 lowers RAMtop to make way for the redefined character set.

Character	Code	Use
#	3	Mushroom
$	5	Aphid
%	5	Border
'	7	Killer Bug

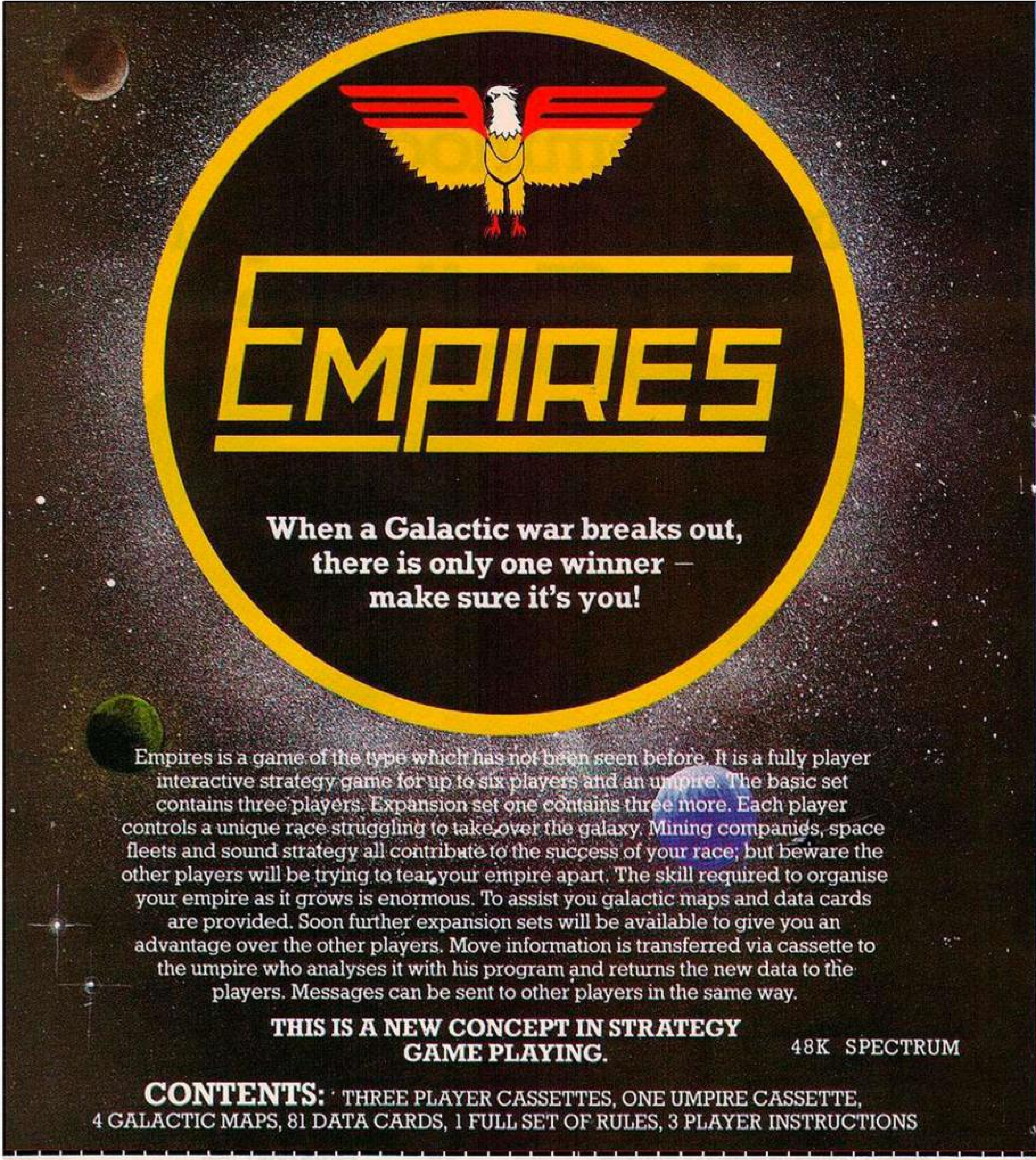
Lines 1500-1790 draw the surrounding border and Poke in all the characters of the display. The various numbers in the loops and in the data statements are offsets from the top left position of the screen. Lines 1630-1660 Poke in the mushrooms and lines 1700-1730 Poke in the bugs provided that nothing already occupies the space.

Lines 2000-2050 alter the display list to give two lines of Graphics 1 followed by 21 lines of Antic mode 4 (Graphics 12) and one line of Graphics 1. Lines 2500-2595 change the character set.

Listing 1.

```
10 GOTO 1000
19 REM ** DELAY SUBROUTINE **
20 FOR D=1 TO DL:NEXT D:RETURN
29 REM ** UP-DATE SCORE ETC **
30 IF SC>CSC THEN CSC=SC:SCORE=CSC+BSC
35 STR=INT(SC)/3:IF STR<0 THEN STR=0
40 POSITION 20,0:? "STR ";INT(STR);"
 ";POSITION 29,0:? "SCORE ";SCORE;
45 IF STR<=0 THEN POP :GOTO 600
50 POKE 77,0:RETURN
59 REM ** CHECK FOR COLLISIONS ETC **
60 M=Z2:M2=Z2-Z
65 IF PEEK(M+M2)=3 THEN 150
70 IF PEEK(M+M2)=4 OR PEEK(M+M2)=5 OR
PEEK(M+M2)=7 THEN 95
75 POKE M,0:POKE M+M2,4
80 SOUND 1,10,8,6:SOUND 1,0,0,0:RETURN

95 FOR I=0 TO 7:M2=MPOS(I)
105 IF PEEK(M+M2)=0 THEN POP :GOTO 75
110 NEXT I
115 POKE Z,0:POKE M,6:GOSUB 815
120 BUGS=BUGS-1:SC=SC+10:SCORE=SCORE+2
:CSC=CSC+2:POKE 20,0:POKE 19,0:IF BUGS
<=0 THEN POP :GOTO 500
125 M=0:M2=0:GOSUB 30
130 RETURN
150 POKE M+M2,4:BUGS=BUGS+1:TS=TS-1:SC
=SC-((LV*6+6)-TS)*4:GOSUB 30:GOTO 60
199 REM ** MAIN GAME ROUTINE **
200 S=STICK(0):IF S=15 THEN Z2=Z+MPOS(
INT(RND(0)*8)):FOR D=1 TO 72-LV*8:NEXT
 D:GOTO 215
210 Z2=Z+ST(S)
215 IF PEEK(Z2)=5 THEN 200
220 IF PEEK(Z2)=3 THEN GOSUB 150
225 IF PEEK(Z2)=4 THEN GOSUB 60
230 IF PEEK(Z2)=7 THEN GOTO 600
235 IF PEEK(19)>3 THEN GOSUB 900
240 FOR D=1 TO 45-LV*5:NEXT D
245 POKE Z,0:Z=Z2:POKE Z,6
250 SOUND 0,12,10,4:SOUND 0,0,0,0
255 GOTO 200
499 REM ** LEVELS AND BONUSES **
500 IF SC<CSC THEN 580
520 GRAPHICS 17:POSITION 6,9:? #6;"LEV
EL ";LV
525 FOR I=1 TO 20-((LV*6+6)-TS):POSITI
ON I-1,11:? #6;"*":BONUS=BONUS+5
530 V=2:GOSUB 810:V=1
535 DL=10:GOSUB 20
540 POSITION 6,13:? #6;"BONUS ";BONUS
545 NEXT I:BSC=BSC+BONUS
550 DL=500:GOSUB 20
555 LV=LV+1:IF LV>9 THEN LV=9
560 ? #6;CHR$(125):POSITION 6,9:? #6;"
LEVEL ";LV:SOUND 0,255,10,8:SOUND 1,25
4,10,8
565 FOR I=0 TO 255:POKE 708,I:NEXT I
575 DL=500:GOSUB 20:GOSUB 820
580 BONUS=0:GRAPHICS 0:POKE 755,0:POKE
 710,0:GOTO 1260
599 REM ** END OF GAME ROUTINE **
600 FOR I=255 TO 0 STEP -5:SOUND 0,255
-I,10,8:FOR D=1 TO 5:NEXT D:POKE Z,I:N
EXT I
610 FOR I=1 TO 3:GOSUB 815:NEXT I
620 GRAPHICS 18:POSITION 5,0:? #6;"GAM
E OVER"
625 IF SCORE>HI THEN HI=SCORE
630 POSITION 2,2:? #6;">>>>>>>>(((((((
("
635 POSITION 5,4:? #6;"SCORE  ";SCORE
640 POSITION 5,6:? #6;"HI-SC  ";HI
645 POSITION 2,8:? #6;">>>>>>>>(((((((
("
650 POSITION 3,10:? #6;"press start to
        play again"
655 POKE 711,PEEK(20)
660 IF PEEK(53279)<>6 THEN 655
665 GRAPHICS 0:POKE 710,0:POKE 755,0:S
C=10:CSC=0:BSC=0:LV=1:GOTO 1260
800 REM ** SOUNDS ETC **
810 FOR S=14 TO 0 STEP -V:SOUND 0,S*10
,12,S:NEXT S
815 FOR S=14 TO 0 STEP -V:SOUND 0,150-
S*10,12,S:NEXT S:SOUND 0,0,0,0:RETURN
820 SOUND 0,0,0,0:SOUND 1,0,0,0:RETURN
899 REM ** ADD NEW KILLER BUG **
900 X=SCREEN+INT(RND(0)*799)+40
910 IF PEEK(X)<>0 THEN 900
920 POKE X,7
930 POKE 19,0:POKE 20,0:RETURN
1000 REM ** TITLES  **
1005 GRAPHICS 18:V=1
1010 FOR I=1 TO 17 STEP 2:POSITION I,0
:? #6;"==":POSITION I,11:? #6;"==":NEX
T I
1020 FOR I=1 TO 8:POSITION I,2:? #6;"b
":POSITION I-1,2:? #6;" ":POSITION 19-
I,2:? #6;"s":POSITION 20-I,2:? #6;" "
1025 GOSUB 80:NEXT I
1029 DL=500:GOSUB 20
1030 POSITION 9,2:? #6;"ug"
1035 GOSUB 810
1040 POSITION 9,5:? #6;"by":POSITION 4
,7:? #6;"les ellingham"
1045 GOSUB 1200:DL=750:GOSUB 20
1050 POSITION 2,5:? #6;"select level "
;LV
1055 POSITION 1,7:? #6;"press start to
 play"
1060 IF PEEK(53279)=5 THEN GOSUB 815:L
V=LV+1:IF LV>9 THEN LV=1
1062 POSITION 15,5:? #6;LV
1065 IF PEEK(53279)=6 THEN 1250
1080 P=PEEK(708):POKE 708,PEEK(710):PO
KE 710,P
1090 DL=250:GOSUB 20
1100 GOTO 1060
1200 REM ** INITIALISE **
1210 DIM ST(14),MPOS(7)
1215 LV=1:SC=10:V=1
1220 FOR I=1 TO 14:READ A:ST(I)=A:NEXT
 I
1225 DATA 0,0,0,0,41,-39,1,0,39,-41,-1
,0,40,-40
1230 FOR I=0 TO 7:READ A:MPOS(I)=A:NEX
T I
1235 DATA 1,-1,39,-39,40,-40,41,-41
1245 RETURN
1250 POKE 106,PEEK(106)-5:GRAPHICS 0:P
OKE 710,0:POKE 755,0
1255 GOSUB 2500
1260 M=0:M2=0:Z=0:Z2=0:BUGS=LV*3:TS=LV
*6+6
1265 POKE 756,CS/256:GOSUB 2000
1270 POKE 710,10
1275 SCREEN=PEEK(88)+256*PEEK(89)
1280 GOSUB 1500:GOSUB 30:POKE 19,0:POK
E 20,0:GOTO 200
1499 REM ** DRAW SCREEN **
1500 FOR I=40 TO 79:POKE SCREEN+I,5:NE
XT I
1510 FOR I=80 TO 839 STEP 40:POKE SCRE
EN+I,5:POKE SCREEN+I+39,5:NEXT I
1520 FOR I=840 TO 879:POKE SCREEN+I,5:
NEXT I
1545 RESTORE 1560
1550 FOR I=1 TO 5:READ A:POKE SCREEN+8
85+I,A:NEXT I
1560 DATA 44,37,54,37,44
1570 POKE SCREEN+892,LV+16
1600 REM
1610 RESTORE 1620:FOR I=1 TO 24:READ A
:POKE SCREEN+A,5:NEXT I
1620 DATA 361,362,363,441,442,443,98,1
08,138,140,170,180,476,477,478,556,557
,558,740,742,780,782,820,822
1630 FOR I=1 TO LV*6+6
1640 X=SCREEN+INT(RND(0)*799)+40
1650 IF PEEK(X)=5 THEN 1640
1660 POKE X,3:NEXT I
1700 FOR I=1 TO LV*3
1710 X=SCREEN+INT(RND(0)*799)+40
1720 IF PEEK(X)=5 OR PEEK(X)=4 THEN 17
10
1730 POKE X,4:NEXT I
1740 Z=SCREEN+500+I:IF PEEK(Z)<>0 THEN
 I=I+1:GOTO 1740
1745 POKE Z,6
1750 X=SCREEN+INT(RND(0)*799)+40
1760 IF PEEK(X)=5 OR PEEK(X)=4 OR PEEK
(X)=3 THEN 1750
1770 POKE X,7
1790 RETURN
2000 REM * NEW DISPLAY LIST *
2005 POKE 559,0
2010 DL=PEEK(560)+256*PEEK(561)
2020 POKE DL+3,70:POKE DL+6,6
2030 FOR I=7 TO 27:POKE DL+I,4:NEXT I:
POKE DL+28,6:POKE DL+29,65
2040 POKE DL+30,PEEK(560):POKE DL+31,P
EEK(561)
2045 POKE 559,34
2050 RETURN
2500 REM * CHANGE CHARACTER SET *
2505 RESTORE 2530
2515 CS=(PEEK(106)+1)*256
2520 DIM MC$(32):FOR I=1 TO 32:READ A:
MC$(I,I)=CHR$(A):NEXT I:A=USR(ADR(MC$)
,57344,CS)
2530 DATA 104,104,133,204,104,133,203,
104,133,206,104,133,205,162,4
2535 DATA 160,0,177,203,145,205,136,20
8,249,230,204,230,206,202,208,240,96
2550 RESTORE 2580
2560 READ A:IF A=-1 THEN RETURN
2570 FOR J=0 TO 7:READ B:POKE CS+A*8+J
,B:NEXT J:GOTO 2560
2580 DATA 6,0,28,65,213,81,213,68,28
2585 DATA 4,130,40,170,170,170,40,40,1
30
2590 DATA 3,68,255,255,169,40,40,40,17
0
2592 DATA 7,65,28,85,85,85,28,28,65
2595 DATA -1
```


EMPIRES
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Empires is a game of the type which has not been seen before. It is a fully player interactive strategy game for up to six players and an umpire. The basic set contains three players. Expansion set one contains three more. Each player controls a unique race struggling to take over the galaxy. Mining companies, space fleets and sound strategy all contribute to the success of your race; but beware the other players will be trying to tear your empire apart. The skill required to organise your empire as it grows is enormous. To assist you galactic maps and data cards are provided. Soon further expansion sets will be available to give you an advantage over the other players. Move information is transferred via cassette to the umpire who analyses it with his program and returns the new data to the players. Messages can be sent to other players in the same way.
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QUICK LOAD

Paul Rhodes with a program to stop you pulling your hair out!

TAPESYS IS A machine code program for the 48K ZX Spectrum designed to alleviate loading frustration. Its main purpose is to decrease loading time, but it can also be used to save and load at a slower, more reliable rate than normal. The program also includes a head reader routine.

The program can be loaded to any location nnnnn in the top 32K of memory — from 32768 to 63663. Before Loading, type

CLEAR nnnnn – 1

This protects Tapesys from the Basic system and the New command. Then load with the line:

LOAD "TAPESYS" CODE nnnnn

Once the code has been loaded, enter the command

PRINT USR nnnnn

This will return the address from which the program can be run with either:

RANDOMIZE USR (run address)

or

RANDOMIZE USR USR nnnnn

followed by a colon, and one of the commands Pause, Save, Load, Verify, Merge or Cat. The syntax for these commands is the same as in Sinclair Basic, including the use of Line, Code, Screen$ and Data as described in the Spectrum manual, the only exception being Cat — under key 9 — which is used with no parameters. Commands can be strung together, separated by colons, as in Basic, for example

RANDOMIZE USR USR nnnnn: PAUSE 4: SAVE "Program" LINE 10: CAT

This line will call the machine code, set it to run at speed 4, Save the program to auto-run on loading from line 10, and finally enter the head reading section of the program.

PAUSE: This command is used to select one of 10 operating speeds, numbered 0 to 9. The syntax for the command is:

PAUSE (required speed option)

The approximate baud rate will then be displayed at the bottom of the screen — see table for more accurate figures. Pause 1 is equivalent to the normal Spectrum load/save, while Pause 9 is nearly 2.5 times as fast. Pause 0 is a special low speed, giving greater reliability when loading. Note that a program or other data block can not be loaded at a different speed to that at which it was saved, so commercial software cannot be loaded using Tapesys — except at pause 1 — unless you make a high or low speed copy of the program. The Pause command can be used in conjunction with any of the other recognised commands.

SAVE, LOAD, VERIFY, MERGE: All these commands are used in exactly the same way as in Basic. They must follow a Rand USR statement, as shown above, and, if the speed is to be changed, a pause n command, as already described. For example

RANDOMIZE USR USR nnnnn: PAUSE 3: SAVE "name" DATA a$(): VERIFY "" DATA a$()

Approximate baud rates taking normal speed at 1500 baud.

Pause	Baud Rate
0	1431
1	1500
2	1860
3	1929
4	2747
5	3048
6	3236
7	3304
8	3474
9	3635

If you wished to save something else, say a screen, at the same speed, then the pause 3 command would not have to be repeated, so the line might read:

RANDOMIZE USR USR nnnnn: SAVE "screen" SCREEN$

The program has two other features worth mentioning here. First, when the item to be loaded is found in the tape, it is indicated on the screen by a flashing asterisk alongside the name. Secondly, if an error occurs during loading, other than Break, the program will instruct you to rewind the tape to the beginning of the program and will start the loading process again.

Now to the built-in head reader, which is called via the Cat command. This routine will load headers from the tape — provided that they were saved at the current operating speed — and will display the information contained in them. This information consists of the type of data on the tape — Basic program, "bytes" file, character ($) or number (#) array; the filename; the auto-run Line number — for a Basic program, the start address — for a "bytes" file — or the array name; and the length of the data block. To exit from Cat, press Break.

The Tapesys program returns to Basic on encountering any character it does not understand. The character could be a CHR$ 13 signifying the end of the line, a command other than Save, Load, Verify, Merge, Cat or Pause, or perhaps a colon placed immediately after a separating colon. This last method can be used to return to Basic in the middle of a line. For example

RANDOMIZE USR USR nnnnn: LOAD " " CODE::BEEP 1,10

To enter the program, type

CLEAR 49999

load your favourite hexloader, or type in and

(continued on page 121)



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Listing 1.

```
  10 REM hexloader
  20 DEF FN h$(a)=CHR$ (INT (a/1
6)+48+7*(a>159))+CHR$ (a-16*INT
(a/16)+48+7*((a-16*INT (a/16))>9
))
  30 DEF FN h(h$)=CODE h$-48-7*(
h$>"9")
  40 INPUT "START ADDRESS:";s
  50 INPUT "FINISH ADDRESS:";f
  60 FOR n=s TO f STEP 8
  62 PRINT n;": ";
  65 LET tot=0
  66 REM input the whole line of
 eight hexidecimal figures from
the first digit to the last with
 spaces between
  67 REM eg. at address 50000 in
put the line from C5 to 42
  70 INPUT a$
  75 IF a$="END" THEN STOP
  77 PRINT a$
  80 FOR b=0 TO 7
  90 LET z=FN h(a$)*16+FN h(a$(2
))
  95 LET tot=tot+z
 100 POKE (n+b),z
 110 LET a$=a$(4 TO )
 120 NEXT b
 130 PRINT " = ";
 135 REM enter total
 140 INPUT t
 150 IF t<>tot THEN PRINT "DATA
INPUT ERROR": GO TO 62
 160 PRINT t
 170 NEXT n
```

(continued from page 119)
run listing 1. Enter 50000 decimal as the start address and 51871 as the end address. Then enter the bytes from listing 3.

Once it has all been typed in, save it with the command

SAVE "TAPESYS" CODE 50000,1872

and save the Basic hexloader, in case it is needed to rectify any mistakes. Verify them both, enter New and type in and run listing 2. This should produce a screen picture, save it at a speed you specify, then clear the screen and attempt to reload it. If you get an error during loading, remember: "If at first you don't succeed . . .".

If however, the computer does not act as expected, then pull the plug to clear the computer, type

CLEAR 49999

and reload the code and the hexloader. Add the line in listing 4, and then type

RUN 100

Check the bytes

The computer will then list the bytes for you to check against listing 3. Write down the address of any errors you see, and when the listing has finished the computer will allow you to correct these mistakes. When finished, type in S as the address, and the corrected code will be saved. Finally, enter New and go back to listing 2. If you cannot afford the time to type all the hex in, perhaps you can afford to send £3 to me at 104 Ventnor Gardens, Luton, Beds., LU3 3SW for a copy of the code on tape.

Finally, I shall mention a few interesting sections of the program. Most important are the SABTS — SAVE bytes — and LDBTS — LOAD bytes — which are almost directly copied from the equivalent ROM routines. Other major sections equivalent to ROM routines are pointed out within the listing, and for further details you should refer to Dr. Ian Logan's excellent *Complete Spectrum ROM Disassembly*, which was invaluable during the development of the Tapesys program. The major extra routines I have added are those dealing with relocating the program, decoding the Basic line, changing the speed, and the head reader. I will now deal briefly with each of these.

The **RELOCATE** routine at the beginning of the program first works out the displacement of the routine from the address to which it was originally assembled — note that if you change the Org, you must also change the LD BC,C350 at the beginning of the program to te new address. On entry, BC always holds the number in the USR statement. The start of the table of addresses to be altered — RELCD — is then calculated using this displacement.

The routine fetches in turn all the 2-byte addresses until it comes across a 0000 at which point it returns with the Run address — PSTRT — in BC.

It adds the displacement to find the enw address, fetches the 2-byte number from this address, adds the displacement to this number, and replaces it in the program, then jumps back to fetch the next address for alteration. The routine modifies itself, so running it a second time will have the same effect, except to return and Run address, which is wahy Randomize USR USR nnnnn works.

Listing 2.

```
  10 BORDER 0: PAPER 1: INK 7: C
LS:
  20 FOR f=0 TO 174 STEP 2: PLOT
 [illegible],f: DRAW OVER 1;f,174-f: PLOT
255,f: DRAW OVER 1;-f,174-f: NEX
T f
  25 FOR f=0 TO 174 STEP 9: PLOT
 0,f: DRAW OVER 1;174-f,-f: PLOT
 255,f: DRAW OVER 1;-174+f,-f: N
EXT f
  30 FOR f=1 TO 7: PRINT PAPER f
-(f=1);AT 7+f,9;"
 : NEXT f
  40 INPUT "PAUSE (0 TO 9):";p
  45 LET p=INT p: IF p<0 OR p>9
THEN GO TO 40
  50 RANDOMIZE USR USR [illegible]: PA
USE p: SAVE "pic-PAUSE"+STR$ pSC
REEN$
  60 CLS : RANDOMIZE USR USR 500
00: LOAD ""SCREEN$
  70 GO TO 40
```

Decoding the Basic line is much simpler. It involves getting the next character in the line after the colon and comparing it to each of the six recognised comands in turn. If it matches, the correct routine is activated, then the next statement is considered. Otherwise, a return is made to Basic, with CH ADD holding the address of the character that does not match. Basic expects either a colon or Enter, so any other character will give error C — Nonsense in Basic.

The changing of the speed involves altering the lengths of the delay loops in SABTS and LDBTS. The eight values for each speed are stored near the end of the program at PAUSD, the current speed number in PAUSNO and the 'nnnn BD' messages at MSGP. The nubmer o possible values recognised is limited to the value in the CP instruction near the beginning of the Pause routine.

Alter speeds easily

You can add your own speeds, or alter those included fairly easily, mainly by trail and error — the methods for calculating the exact values are too complicated to go into here; except that the fourth and seventh numbers should be identical, and the fifth number two greater. Remember, if you add a speed, you must also add a message to the MSGP list, terminated by 8D hex, and alter the CP instruction mentioned above. The routine that modifies the SABTS and LDBTS routines works on a table of displacements at PAUSD2. For example, the second number goes six bytes after the first, and the third, 14 bytes after the second. If you modify the program at all within the SABTS, LDBTS or TDE routines, you may have to alter those bytes too.

The **CAT** routine repeatedly loads a header from the tape and prints out the type and name as usual, then jumps to the relevant routine for the type to print out the line number/start address/arry name, before returning to the next header ont he tae.

I hope the program saves you much time and, perhaps, gives you ideas of your own to develop.

Listing 3.

```
50000: C5 E1 01 50 C3 A7 ED 42  = 1168
50008: E5 C1 21 10 CA 09 5E 23  = 811
50016: 56 23 7A B3 28 0F E5 EB  = 941
50024: 09 5E 23 56 ED 09 EB 72  = 817
50032: 2B 73 E1 18 E9 01 79 C3  = 957
50040: C9 C3 BB C4 21 A4 C4 E5  = 1401
50048: 21 80 1F CB 7F 28 03 21  = 598
50056: 98 0C 08 13 DD 2B F3 3E  = 760
50064: 01 47 10 FE D3 FE EE 08  = 1056
50072: 06 A4 2D 20 F5 05 25 F2  = 776
50080: 92 C3 06 2F 10 FE D3 FE  = 1129
50088: 3E 0B 06 37 10 FE D3 FE  = 866
50096: 01 0C 3B 08 6F 18 09 7A  = 346
50104: B3 28 0B DD 6E 00 7C AD  = 858
50112: 67 3E 01 37 18 17 6C 18  = 400
50120: F5 79 CB 78 10 FE 30 04  = 1011
50128: 06 1A 10 FE D3 FE 06 15  = 794
50136: 20 EF 05 AF 3C CB 15 20  = 767
50144: EB 1B DD 23 06 0B 3E 7F  = 721
50152: DB FE 1F D0 7A 3C 20 C7  = 1125
50160: 06 3B 10 FE C9 14 0B 15  = 585
50168: F3 3E 09 D3 FE 21 A4 C4  = 1172
50176: E5 DB FE 1F E6 20 F6 02  = 1243
50184: 4F BF C0 CD 85 C4 30 FA  = 1294
50192: 21 15 04 10 FE 2B 7C B5  = 676
50200: 20 F9 CD 81 C4 30 EB 06  = 1100
50208: 9C CD 81 C4 30 E4 3E C6  = 1222
50216: B8 30 E0 24 20 F1 06 C9  = 972
50224: CD 85 C4 30 D5 78 FE D4  = 1381
50232: 30 F4 CD 85 C4 D0 79 EE  = 1393
50240: 02 4F 26 00 06 E2 18 1F  = 406
50248: 08 20 07 30 0F DD 75 00  = 448
50256: 18 0F CB 11 AD C0 79 1F  = 776
50264: 4F 13 18 07 DD 7E 00 AD  = 649
50272: C0 DD 23 1B 08 06 E4 2E  = 763
50280: 01 CD 81 C4 D0 3E ED B8  = 1222
50288: CB 15 06 E2 30 F3 7C AD  = 1044
50296: 67 7A B3 20 CB 7C FE 01  = 1018
50304: C9 CD 85 C4 D0 3E 07 3D  = 1073
50312: 20 FD A7 04 C8 3E 7F DB  = 1064
50320: FE 1F D0 A9 E6 20 28 F3  = 1207
50328: 79 EE FA 4F E6 07 F6 08  = 1179
50336: D3 FE 37 C9 F5 3A 48 5C  = 1188
50344: E6 38 0F 0F 0F D3 FE 3E  = 858
50352: 7F DB FE 1F FB 38 02 CF  = 1147
50360: 0C F1 C9 CD E7 C8 DF FE  = 1567
50368: 3A C0 E7 FE FB 20 06 AF  = 1196
50376: 32 9E CA 18 34 FE EF 20  = 1011
50384: 07 3E 01 32 9E CA 18 29  = 545
50392: FE D6 20 07 3E 02 32 9E  = 779
50400: CA 18 1E FE D5 20 07 3E  = 824
50408: 03 32 9E CA 18 13 FE CF  = 917
50416: 20 07 3E 04 32 9E CA 18  = 539
50424: 08 FE F2 C0 CD B0 C8 18  = 1301
50432: BA 01 11 00 3A 9E CA A7  = 789
50440: 28 02 0E 22 F7 D5 DD E1  = 996
50448: 06 0B 3E 20 12 13 10 FC  = 416
50456: DD 36 01 FF CD 9F C8 21  = 1128
50464: F6 FF 0B 09 03 30 0F 3A  = 645
50472: 9E CA A7 20 02 CF 0E 78  = 902
50480: B1 28 0A 01 0A 00 DD E5  = 688
50488: E1 23 EB ED B0 DF FE E4  = 1613
50496: 20 41 3A 9E CA FE 03 CA  = 974
50504: BA 1C E7 CD B2 28 CB F9  = 1272
50512: 30 0B 21 00 00 3A 9E CA  = 510
50520: 3D 28 10 CF 01 C2 BA 1C  = 685
50528: 23 7E DD 77 0B 23 7E DD  = 894
50536: 77 0C 23 DD 71 0E 3E 01  = 577
50544: CB 71 28 01 3C DD 77 00  = 757
50552: EB E7 FE 29 20 DF E7 EB  = 1482
```

(Listing 3 continued on next page)

152
79
79
208
43

243
62
747

0 – 9

A = 10
B = 11
C = 12
D = 13
E = 14

(Listing continued from previous page)

```
50560: C3 31 C6 FE AA 20 1C 3A  = 984
50568: 9E CA FE 03 CA 8A 1C E7  = 1216
50576: DD 36 0B 00 DD 36 0C 1B  = 600
50584: 21 00 40 DD 75 0D DD 74  = 785
50592: 0E 1B 4A FE AF 20 4C 3A  = 707
50600: 9E CA FE 03 CA 8A 1C E7  = 1216
50608: CD 48 20 20 0C 3A 9E CA  = 771
50616: A7 CA 8A 1C CD E6 1C 18  = 1022
50624: 0F CD 82 1C DF FE 2C 28  = 939
50632: 0C 3A 9E CA A7 CA 8A 1C  = 965
50640: CD E6 1C 18 04 E7 CD 82  = 1057
50648: 1C CD 99 1E DD 71 0B DD  = 982
50656: 70 0C CD 99 1E DD 71 0D  = 859
50664: DD 70 0E 60 69 DD 36 00  = 823
50672: 03 18 3E FE CA 28 06 DD  = 812
50680: 36 0E 80 18 14 3A 9E CA  = 658
50688: A7 C2 8A 1C E7 CD 82 1C  = 1121
50696: CD 99 1E DD 71 0D DD 70  = 1068
50704: 0E DD 36 00 00 2A 59 5C  = 512
50712: ED 5B 53 5C 37 ED 52 DD  = 1098
50720: 75 0B DD 74 0C 2A 4B 5C  = 686
50728: ED 52 DD 75 0F DD 74 10  = 1025
50736: EB 3A 9E CA A7 CA 6B CB  = 1329
50744: E5 01 11 00 DD 09 DD 22  = 732
50752: 9B CA 22 9A CA ED 73 9C  = 1252
50760: CA DD E5 11 11 00 AF 37  = 916
50768: CD F5 C3 DD E1 30 F2 3E  = 1443
50776: FE CD 01 16 FD 36 52 07  = 878
50784: 0E 80 DD 7E 00 DD BE EF  = 1139
50792: 20 02 0E F6 FE 04 30 D9  = 817
50800: 11 34 C9 C5 CD 0A 0C C1  = 887
50808: DD E5 D1 21 F0 FF 19 06  = 1218
50816: 0A 7E 3C 20 03 79 80 4F  = 559
50824: 13 1A BE 23 20 01 0C D7  = 530
50832: 10 F6 3A 9E CA FE 04 C2  = 1132
50840: 1A C7 C5 E5 D5 DD E5 3E  = 1376
50848: 17 D7 3E 05 D7 3E 20 D7  = 829
50856: DD 7E 00 FE 00 20 22 DD  = 888
50864: 7E 0E E6 C0 20 11 3E CA  = 875
50872: D7 DD 4E 0D DD 46 0E CD  = 1037
50880: 2B 2D CD E3 2D 18 1A 3E  = 677
50888: 01 11 55 C9 CD 0A 0C 18  = 555
50896: 10 FE 03 20 24 DD 4E 0D  = 653
50904: DD 46 0E CD 2B 2D CD E3  = 1030
50912: 2D 3E 2C D7 DD 4E 0B DD  = 897
50920: 46 0C CD 2B 2D CD E3 2D  = 852
50928: AF 11 55 C9 CD 0A 0C 18  = 729
50936: 1A DD 7E 0E E6 7F F6 40  = 1054
50944: D7 DD 7E 00 FE 02 20 03  = 853
50952: 3E 24 D7 3E 28 D7 3E 29  = 733
50960: D7 18 CE DD E1 D1 E1 C1  = 1518
50968: 0E FF CB 79 C2 49 C6 3E  = 1120
50976: 20 D7 3E 12 D7 3E 01 D7  = 820
50984: 3E 2A D7 3E 0D D7 E1 DD  = 1055
50992: 7E 00 FE 03 28 0C 3A 9E  = 651
51000: CA 3D CA 99 C7 FE 02 CA  = 1275
51008: 47 CB E5 DD 6E FA DD 66  = 1404
51016: FB DD 5E 0B DD 56 0C 7C  = 1020
51024: B5 28 0D ED 52 38 28 28  = 689
51032: 07 DD 7E 00 FE 03 20 1F  = 674
51040: E1 7C B5 20 06 DD 6E 0D  = 912
51048: DD 66 0E E5 DD E1 3A 9E  = 1228
51056: CA FE 02 37 20 01 A7 3E  = 775
51064: FF CD F5 C3 DA BE C4 11  = 1521
51072: 0A C9 AF CD 0A 0C DD 2A  = 876
51080: 9B CA 2A 9A CA ED 7B 9C  = 1268
51088: CA C1 E5 01 11 00 C3 49  = 910
51096: C6 DD 5E 0B DD 56 0C E5  = 1072
51104: 7C B5 20 06 13 13 13 EB  = 635
51112: 18 0C DD 6E FA DD 66 FB  = 1191
51120: EB 37 ED 52 38 09 11 05  = 696
51128: 00 19 44 4D CD 05 1F E1  = 636
51136: DD 7E 00 A7 28 3E 7C B5  = 921
51144: 28 13 2B 46 2B 4E 2B 03  = 339
51152: 03 03 DD 22 5F 5C CD EB  = 885
51160: 19 DD 2A 5F 5C 2A 59 5C  = 698
51168: 2B DD 4E 0B DD 46 0C C5  = 853
51176: 03 03 03 DD 7E FD F5 CD  = 1059
51184: 55 16 23 F1 77 D1 23 73  = 861
51192: 23 72 23 E5 DD E1 37 3E  = 976
51200: FF C3 79 C7 EB 2A 59 5C  = 1228
51208: 2B DD 22 5F 5C DD 4E 0B  = 795
51216: DD 46 0C C5 CD E5 19 C1  = 1152
51224: E5 C5 CD 55 16 DD 2A 5F  = 1096
51232: 5C 23 DD 4E 0F DD 46 10  = 748
51240: 09 22 4B 5C DD 66 0E 7C  = 671
51248: E6 C0 20 0A DD 6E 0D 22  = 842
51256: 42 5C FD 36 0A 00 D1 DD  = 905
51264: E1 37 3E FF C3 79 C7 DD  = 1333
51272: 4E 0B DD 46 0C C5 03 F7  = 839
51280: 36 80 EB D1 E5 E5 DD E1  = 1530
51288: 37 3E FF CD F5 C3 38 03  = 1076
51296: C3 7F C7 E1 ED 5B 53 5C  = 1249
51304: C3 D2 0B E5 3E FD CD 01  = 1163
51312: 16 AF 11 A1 09 CD 0A 0C  = 611
51320: FD CB 02 EE CD D4 15 DD  = 1355
51328: E5 11 11 00 AF CD 7C C3  = 962
51336: DD E1 06 32 76 10 FD DD  = 1110
51344: 5E 0B DD 56 0C 3E FF DD  = 962
51352: E1 CD 7C C3 C3 BE C4 01  = 1331
51360: 00 00 3A 9E CA FE 04 CB  = 876
51368: E7 CD BC 1C CD F1 28 C9  = 1294
51376: E7 CD 82 1C CD 99 1E 79  = 1103
51384: FE 0A D0 32 B5 C9 DD 21  = 1158
51392: B6 C9 21 D1 C3 11 06 CA  = 1045
51400: A7 CB 21 CB 21 CB 21 06  = 881
51408: 00 DD 09 06 08 C5 DD 7E  = 788
51416: 00 77 06 00 EB 4E EB 13  = 692
51424: 09 DD 23 C1 10 EF C9 11  = 931
51432: 64 C9 3A B5 C9 F5 D5 3E  = 1261
51440: 00 CD 01 16 3E 16 D7 AF  = 702
51448: D7 AF D7 21 00 01 11 00  = 656
51456: 01 CD B5 03 D1 F1 CD 0A  = 1055
51464: 0C C9 FF 0D 12 01 10 02  = 518
51472: 11 06 13 01 20 4C 4F 41  = 295
51480: 44 49 4E 47 20 20 45 52  = 505
51488: 52 4F 52 20 2D 2D 20 52  = 479
51496: 45 57 49 4E 44 20 20 54  = 523
51504: 41 50 45 20 BD 0D 3E 42  = 528
51512: 41 53 49 43 BA 0D 23 41  = 587
51520: 52 52 41 59 BA 0D 24 41  = 618
51528: 52 52 41 59 BA 0D 3E 42  = 645
51536: 59 54 45 53 BA 80 20 42  = 737
51544: 59 54 45 53 BD 4E 4F 20  = 655
51552: 4C 49 4E C5 BD 31 34 30  = 714
51560: 30 20 62 64 BD 31 35 30  = 569
51568: 30 20 62 64 BD 31 38 35  = 577
51576: 30 20 62 64 BD 31 39 30  = 573
51584: 30 20 62 64 BD 32 37 35  = 577
51592: 30 20 62 64 BD 33 30 35  = 571
51600: 30 20 62 64 BD 33 32 35  = 573
51608: 30 20 62 64 BD 33 33 30  = 569
51616: 30 20 62 64 BD 33 35 30  = 571
51624: 30 20 62 64 BD 33 36 35  = 577
51632: 30 20 62 64 BD 09 46 41  = 563
51640: 34 AC AE C8 AC 16 43 3E  = 921
51648: 31 80 B2 CB B0 16 35 30  = 905
51656: 23 C2 C4 DB C2 15 33 2E  = 953
51664: 21 C5 C7 DA C5 15 23 1E  = 930
51672: 11 DB DA E6 DB 0C 1F 1A  = 966
51680: 0D DC DE E9 DC 0A 1D 18  = 971
51688: 0B DF E1 EB DF 09 1C 17  = 977
51696: 0A E0 E2 EC E0 0B 1B 16  = 977
51704: 09 E1 E3 EC E1 0B 1A 15  = 977
51712: 0B E2 E4 ED E2 07 06 0E  = 952
51720: 60 21 08 05 13 FE 00 EF  = 654
51728: 76 C3 C9 C4 D4 C4 DF C4  = 1537
51736: EA C4 F5 C4 71 C6 F2 C6  = 1622
51744: 7A C3 7D C3 6A C4 B2 C4  = 1265
51752: 32 C6 1D C7 7A C7 7D C7  = 1121
51760: 80 C7 02 C8 81 C5 45 CB  = 1124
51768: A0 C3 FE C3 36 C6 97 C7  = 1406
51776: 1B C4 22 C4 0C C4 31 C4  = 906
51784: 3B C4 FD C4 1D C5 51 C6  = 1209
51792: 5C C8 61 C8 86 C8 9A CB  = 1277
51800: 05 C5 28 C5 43 C5 40 C6  = 965
51808: 43 C6 37 C7 6F C7 8B C7  = 1164
51816: 8B C7 47 C6 3B C7 40 C7  = 1128
51824: 8F C7 A3 C8 C0 C8 C3 C8  = 1492
51832: C6 C8 56 C5 8B C5 A8 C5  = 1379
51840: B6 C5 CA C5 FE C5 93 C6  = 1574
51848: 98 C6 9D C8 BC C4 E8 CB  = 1523
51856: EB CB BC C8 53 C3 00 00  = 1101
51864: 01 5F 00 40 36 C3 01 FF  = 665
```

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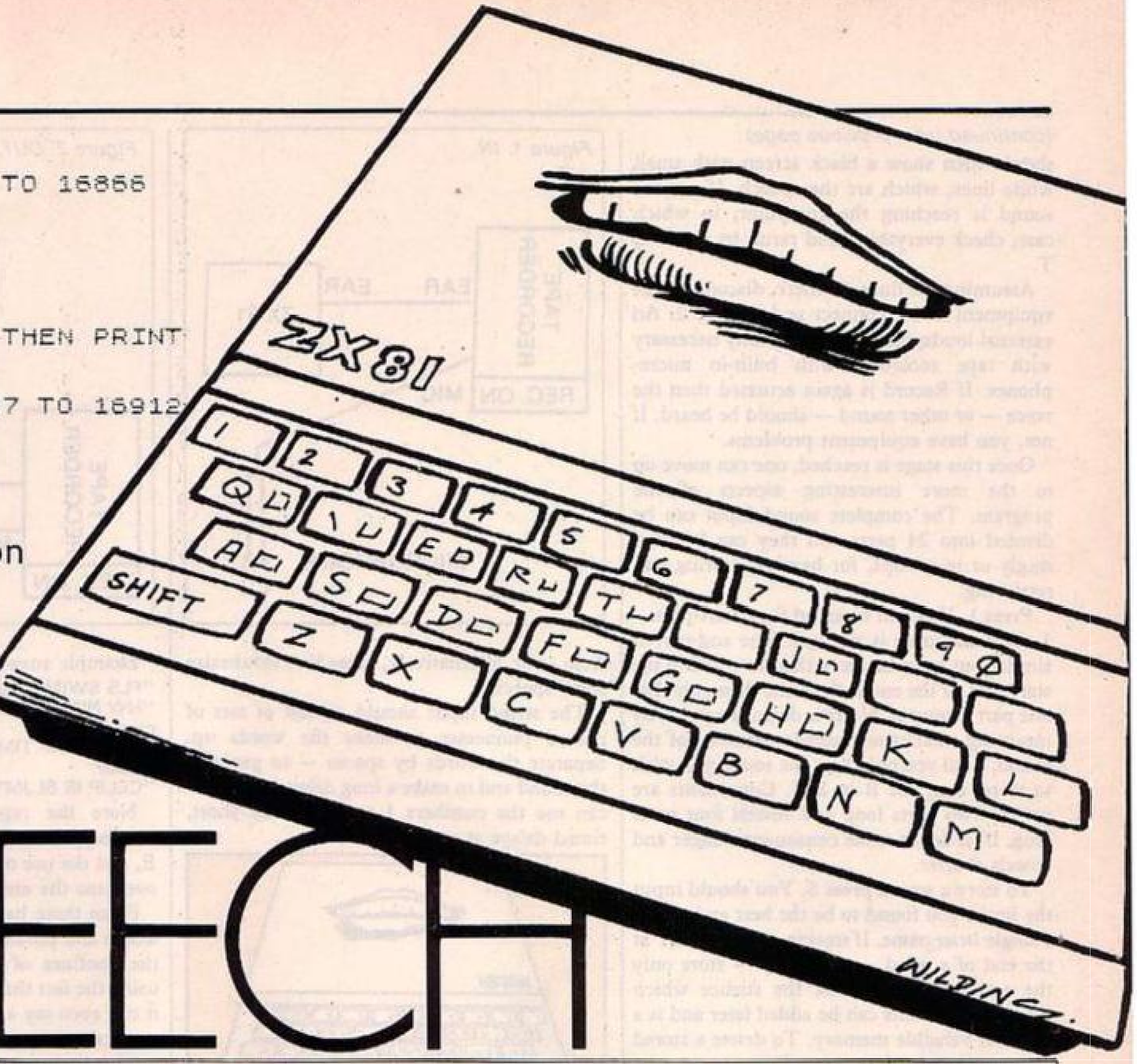
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Listing 1.

```
10 LET T=0
20 FOR A=16514 TO 16866
30 INPUT X
40 POKE A,X
50 SCROLL
60 PRINT A,X
70 LET T=T+X
80 NEXT A
90 IF T<>32625 THEN PRINT "ERR
OR IN DATA";0
 100 FOR A=16867 TO 16912
 110 POKE A,70
 120 NEXT A
```



SPEECH

J N Creak gets into conversation with his ZX-81.

Listing 2.

```
 10 PRINT "PRESS ANY KEY TO CON
T."
 15 PAUSE 4E4
 20 RAND USR 16514
 25 PAUSE 4E4
 30 POKE 16542,104
 35 POKE 16566,128
 50 CLS
 60 RAND USR 16540
 70 IF INKEY$<>"" THEN GOTO 150
0
 80 FOR A=1 TO 50
 90 NEXT A
 95 GOTO 50
100 GOSUB 3000
105 GOSUB 1000
110 PRINT "WHAT NAME ?"
115 INPUT A$
120 CLS
130 POKE 16670,CODE A$
140 POKE 16671,U-O+1
150 POKE 16672,O+103
160 LET A=INT (USR 16676/256)
170 IF A=1 THEN GOTO 2100
180 IF A=2 THEN GOTO 2200
190 RETURN
200 GOSUB 3000
205 PRINT "WHAT LETTER ?"
210 INPUT A$
215 CLS
220 POKE 16670,CODE A$
230 IF USR 16741<256 THEN GOTO
2300
 240 RETURN
 500 GOSUB 1000
 510 POKE 16542,103+O
 520 POKE 16566,104+U
 530 RETURN
1000 PRINT "WHAT START (1 TO 24)
?"
1010 INPUT O
1020 PRINT "AND END (1 TO 24) ?"
1030 INPUT U
1040 RETURN
1500 IF INKEY$="T" THEN RUN
1510 IF INKEY$="1" THEN GOSUB 50
0
1520 IF INKEY$="S" THEN GOSUB 10
0
1530 IF INKEY$="V" THEN GOTO 200
0
1540 IF INKEY$="D" THEN GOSUB 20
0
1550 GOTO 80
2000 POKE 16542,104
2005 GOSUB 3000
2010 PRINT "ENTER LETTERS NOW"
2015 CLEAR
2020 DIM A$(25)
2025 INPUT B$
2030 CLS
2035 LET A$=B$+" £"
2040 IF USR 16570<256 THEN GOTO
2500
2050 FOR A=1 TO 140
2060 IF INKEY$<>"" THEN GOTO 210
0
2070 NEXT A
2080 GOTO 2040
2100 PRINT "NO ROOM - MEM. FULL.
", "THINK AGAIN"
2110 PAUSE 100
2120 RETURN
2200 PRINT "DATA LIST FULL.",,"T
HINK AGAIN"
2210 PAUSE 100
2220 RETURN
2300 PRINT "NO SUCH PHONEME: """
;A$;"""."
2310 PAUSE 100
2320 RETURN
2400 CLEAR
2410 GOTO 1100
2500 PRINT "PHONEME NAME NOT FOU
ND."
2510 PAUSE 100
2520 GOTO 2400
3000 PRINT "PHONEME:","LENGTH:"
,
3010 LET A=PEEK 16673+256*PEEK 1
6674
3020 IF A=16867 THEN GOTO 3060
3030 FOR A=16867 TO A-3 STEP 3
3040 PRINT TAB 2;CHR$ PEEK A;TAB
 18;PEEK (A+2)
3050 NEXT A
3060 PRINT ,,,,
3070 RETURN
```

USING THE excellent 48K Spectrum Speaks article in the June 1983 edition of *Your Computer,* it is possible to make an actual speech processor on a 16K ZX-81.

This program uses a "ZX-81isation" of that routine as its basis. Manipulation of the data is, however, made far easier.

The sounds can be stored and retrieved so that it is possible to construct whole sentences phonetically by joining together the stored sounds. 16K RAM is very limiting for the amount of data necessary to make useful speed possible, but the program uses it to its best possible advantage.

To enter the program first set RAMtop to 19712 in the usual way by:

```
POKE 16389,77
NEW
```

Next type in the hexadecimal loader program — listing 1 — and enter the machine code. When this is complete delete the loader program line-by-line and enter listing 2.

I suggest you now save it several times in case the machine code crashes when executed. A single error will generally cause a complete system reset, deleting everything, including any data above RAMtop.

Set up tape recorder

The next thing to do is to set up your tape recorder and ZX-81 as in figure 1. This works on the principle that almost all portable tape recorders have a monitor function during recording. This means that what is being recorded through the microphone can be put to an external loudspeaker or, in this case, to a computer. If you have no separate microphone but your tape recorder has a built-in one, then use that.

Set up the equipment, insert a fairly long blank tape — or one that can be overwritten — and start recording. Alternatively, you can play a recorded tape into the computer directly, without speaking, at about 1¼ times normal loading volume.

Set to Fast mode. Type Run and you will get a prompt. Decide what to say into the machine first, press Newline, and say it. If you make a mistake or over-run the time limit, hold down T when the prompt reappears. When it reappears for a second time it is ready to go again. If you have said the word correctly, just press Newline. The TV screen

(continued on next page)

(continued from previous page)

should then show a black screen with small white lines, which are the speech. If not, no sound is reaching the computer, in which case, check everything and rerun by pressing T.

Assuming the lines are there, disconnect the equipment and reconnect as in figure 2. An external loudspeaker is usually only necessary with tape recorders with built-in microphones. If Record is again actuated then the voice — or other sound — should be heard. If not, you have equipment problems.

Once this stage is reached, one can move on to the more interesting aspects of the program. The complete sound input can be divided into 24 parts and they can be used singly or in groups, for hearing, storing and retrieving.

Press 1. You will be asked for a start-part — 1 to 24 inclusive is allowed. The end-part is similar but must be more than or equal to the start-part. If the end is the same then only that one part is output. Narrow down the parts, by inputting smaller and smaller sections of the sound, until you only hear the sound you wish to store, e.g., the B in Ball. Consonants are usually two parts long and vowels four parts long. If in doubt make consonants longer and vowels shorter.

To store a sound press S. You should input the limits you found to be the best and give it a single *letter* name. If storing a sound like P at the end of a word — as in help — store only the actual noise and not the silence which preceeds it, as this can be added later and is a waste of valuable memory. To delete a stored phoneme at any time, press D.

When you have stored all the sounds you want from a particular word in memory, press T to input another word — to get more sounds from — or, alternatively, press V to synthesize some speech.

The string input should consist of sets of named phonemes to make the words up. Separate the words by spaces — to generate the sound and to make a long delay — and you can use the numbers 1 to 9 to make short, timed delays at any point.

Figure 1. IN.

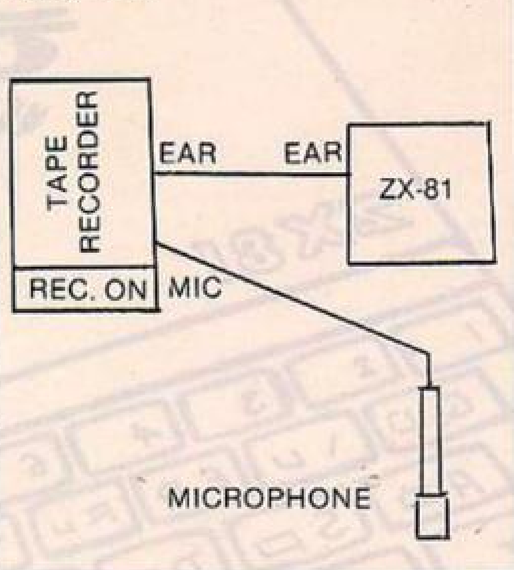
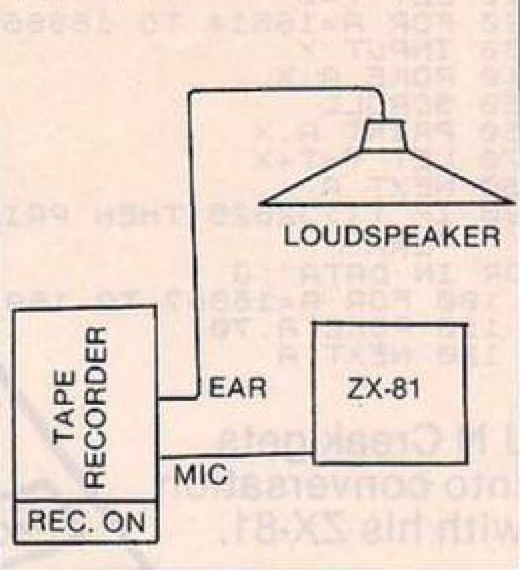
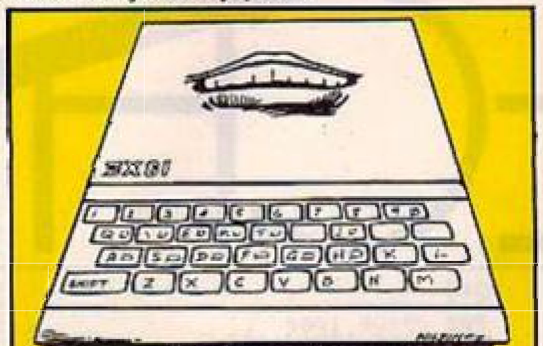


Figure 2. OUT.





Example answers to the synthesis input:
"FLS SWIM QICLIF" — 'eels swim quickly'
"HW NW BRWN CW" — 'how now brown cow'
"TEL MF HF TIM PLFZ" — 'tell me the time please'
"CELIP IS SLJM1F" — 'kelp is slimy'

Note the repetition of sounds to save memory, the use of E and F as soft and hard E, and the use of 1 as a short delay. If a word overruns the memory a tone is generated.

From these basic principles large, complex words and phrases can be synthesized, within the confines of the memory. For example, using the fact that A, B, C, D etc. end in "ee", it can even say a large part of the alphabet, if correctly programmed.

This program does all it can with the RAM available, but is still very limited. Nevertheless, it gives a good demonstration of what can be done on a small microcomputer.

Machine code.

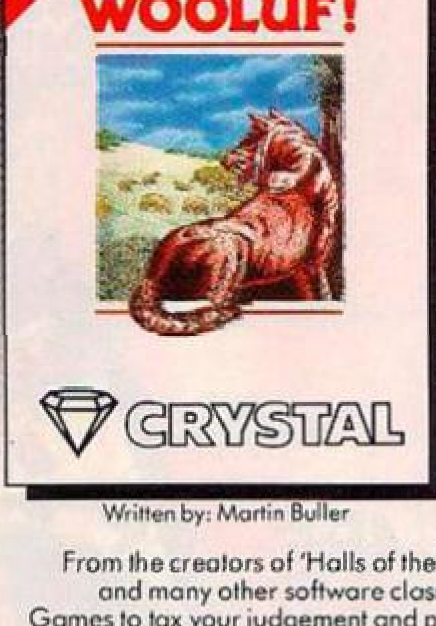
16514	33	0	104	6	8
16519	219	254	254	255	32
16524	2	203	254	203	62
16529	16	244	203	14	35
16534	124	254	128	32	234
16539	201	33	0	104	6
16544	8	203	70	40	4
16549	62	0	211	255	0
16554	0	219	254	203	6
16559	16	240	203	6	35
16564	124	254	128	32	230
16569	201	42	16	64	1
16574	5	0	9	17	0
16579	104	35	70	120	254
16584	12	200	229	254	0
16589	32	25	122	50	182
16594	64	205	156	64	62
16599	160	6	0	42	0
16604	0	42	0	0	16
16609	248	61	32	243	225
16614	24	217	254	29	56
16619	20	254	38	48	16
16624	214	28	71	14	0
16629	11	98	107	19	54
16634	0	237	176	225	24
16639	196	33	227	65	6
16644	15	78	185	40	7
16649	35	35	35	16	247
16654	225	201	35	35	70
16659	14	0	43	102	46
16664	0	237	176	225	24
16669	166	0	0	0	227
16674	65	77	14	0	58
16679	31	65	71	58	35
16684	65	128	38	105	188

16689	6	1	208	237	91
16694	33	65	33	16	66
16699	167	237	82	6	2
16704	200	33	30	65	237
16709	160	58	35	65	18
16714	19	237	160	237	83
16719	33	65	27	26	71
16724	14	0	102	46	0
16729	27	26	87	30	0
16734	237	176	122	50	35
16739	65	201	17	3	0
16744	58	30	65	33	227
16749	65	6	15	190	25
16754	40	3	16	250	201
16759	62	70	190	40	83
16764	235	42	33	65	167
16769	237	82	229	213	17
16774	3	0	6	0	4
16779	167	237	82	32	250
16784	225	229	35	78	58
16789	35	65	145	197	71
16794	167	237	82	86	97
16799	14	0	89	107	237
16804	176	122	50	35	65
16809	193	225	43	78	84
16814	93	35	27	27	241
16819	197	245	193	0	0
16824	0	213	237	176	237
16829	83	33	65	209	193
16834	19	26	145	18	19
16839	19	16	248	62	70
16844	18	4	201	167	237
16849	82	119	34	33	65
16854	35	35	78	58	35
16859	65	145	50	35	65
16864	6	1	201		

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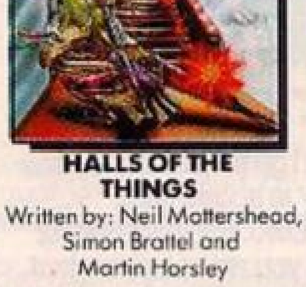
Written by: Martin Buller



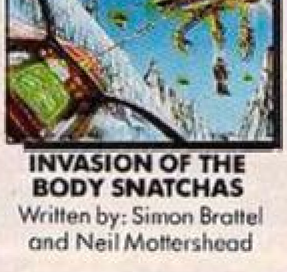
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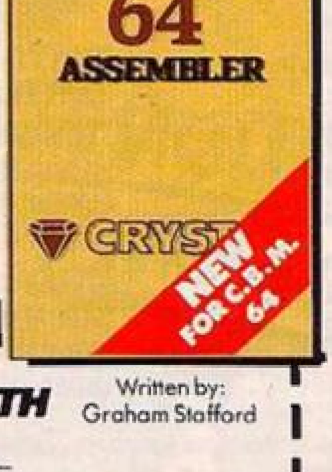
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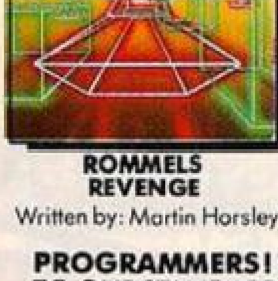
HALLS OF THE THINGS
Written by: Neil Mottershead, Simon Brattel and Martin Horsley



INVASION OF THE BODY SNATCHAS
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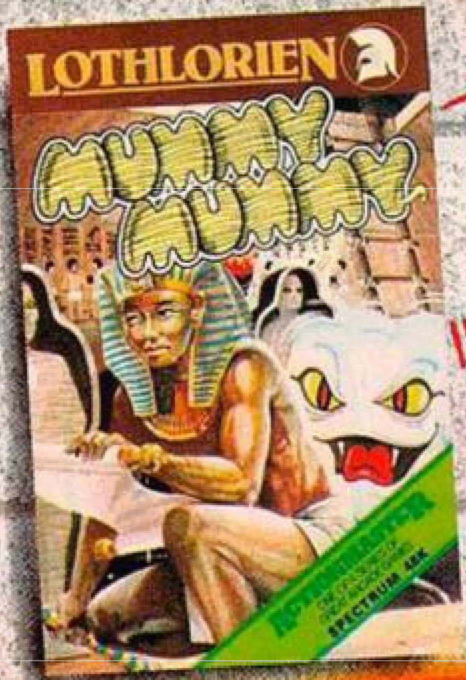
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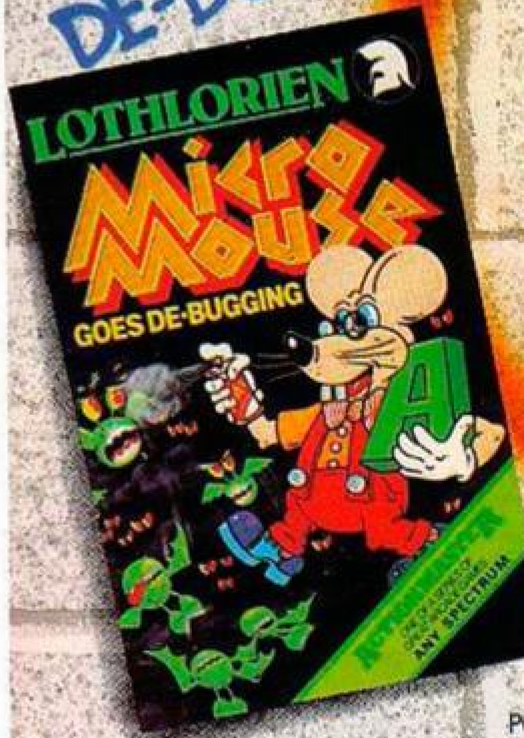
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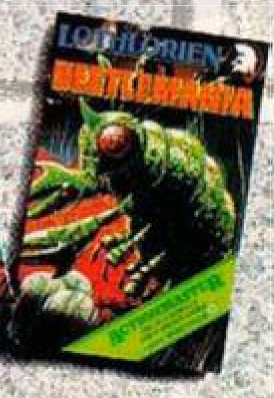
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BBC SPOOLER

Fintan Culwin explains a utility written in machine code which will allow ASCII files to be transferred from back store to printer.

PROFESSIONAL MICROS and dedicated word processors have the ability to print a document "in the background", while the machine is actually being used for some other activity. I have always regarded the BBC as a professional machine and have produced this utility which allows ASCII files to be transferred from backing store to printer without causing too many problems for the machine's user.

The routine is written in machine code and assembles into just 253 bytes of memory, allowing it to be fitted into the cassette filing system's reserved page (&OD), or any extra page of memory for the disc system. The code is non-relocatable and will have to be reassembled if its location is to be moved. The routine has been written to Acorn's published standards for adding utilities and should cause no problems for other such systems. Unfortunately it appears to be incompatible with Wordwise. Possibly this is because Wordwise redirects screen output in an unusual way.

Once installed in memory the routine is activated by a call to its load address plus hex 1A — &D1C in the page &0D version. It can also be installed on disc and accessed with a *Spool command — see your disc manual. The routine will clear the screen announce itself and await input of the file name and the number of copies.

The spooler will only cope with ASCII files. That is Basic listings which have been Execed — see user guide page 402 — or text files which have been saved in a formatted state as in Wordwise option 8.

Non-user-friendly

In order to fit the routine into one page of memory some degree of user-friendliness has been sacrificed. The number of copies to be spooled and the name of the file to be spooled have to be given in one command. The first character is interpreted as the number of copies, and the remaining characters up to a maximum of 10 as the filename. The one character determining the number of copies is interpreted by subtracting &30 from its ASCII code. Conveniently this gives one copy for the character "1", two copies for "2" etc. If more than nine copies are required then the alphabetic characters

:; <=>?@ABC . . . .

onwards have to be used. Not friendly or convenient to use but it did save a few bytes.

For tape users the cassette relay will become active as the CFS — cassette filing system — looks to open the file on the tape; this could take some time and would require the tape to be rewound after each copy of the document had been spoiled. For disc users, the file — if it exists — will be opened; otherwise the Spool Error message will be output to the printer.

Once the file has been opened, one

(continued on next page)

```
100*FX 5,2
110*FX 8,5
120WRCHV = &20E
130OSWORD = &FFF1
140OSFIND = &FFCE
150OSBGET = &FFD7
160OSWRCH = &FFEE
170OSBYTE = &FFF4    :REM operating system locations
180form_feed% = &0C
190CODE% = &D02      :REM address of machine code
200temp% = CODE%
210STOREVECT = CODE%+1  :REM new vector location
```

(listing continued on next page)

(continued from previous page)

character will be sent from the file to the printer every time a character is sent to the screen. If you are not going to be using the micro for a period of time and want the spooling to continue, put in a dummy list or preview command. Spooling will slow the system down. This is especially noticeable for tape users every time an inter-block gap is met. This is not too much of a problem, as whilst spooling the micro can run faster than I can type. After each copy of the document has been spooled, a form-feed will be executed. After the last copy has been spooled the routine will disable itself and can be called again in the same way.

For those who have no wish to delve into the mysteries of the operating system or assembler code then all that needs to be noted about the listing is that the location of the routine is determined by the value of the variable Code% in line 190 of the listing. I have used Basic 1, the early part of the listing can be simplified by using the EQU assembler commands available in Basic2.

After the spooler has been installed by running the assembler program the utility can be saved directly by using the command:

6*SAVE"SPOOL" PPPP+FF (PPPP+&27)

where PPPP is the hex page address of the code, +FF gives the length of the code and (PPPP+&27) is the execution address hex 27 bytes higher than the value of Code%. When assembling into page &0D the first two bytes should be left unused as this area is polled by O.S. 1.2 and the Econet filing system. It is usually safe to start at the beginning of a page in other locations.

Vectored through RAM

The most obvious method to implement such a system would be to use the vectored interrupts of the BBC operating system. The spooler would then act totally independently of the front end of the system. For example, every second tenth of a second or so — which is no good for this application, as the interrupt routine must return within one to two milliseconds. When dealing with peripheral devices, even discs, this time limit cannot be guaranteed and other methods have to be used.

The other method of diverting the micro from its usual path is to use the vectored routines; the two most obvious are the Read character vector and the Write character vector. These are not time critical, and will cope with the long delays of the tape system. Every time the keyboard is read or a character is output to the screen the operating system and any other system which has been correctly written uses OSWRCH for writing and OSRDCH for reading.

The obvious place to put the routine would be via OSRDCH. But this would only send characters to the printer every time a key is pressed — which is slower than if it were every time a character was sent to the screen. The problem with using OSWRCH is that the routine itself should use OSWRCH to send characters to the printer.

Both these routines are vectored through the machine's RAM space, allowing them to be changed. If they exited solely in ROM then

(continued on page 133)

(listing continued from previous page)

```
220channel% = CODE%+3   :REM channel number location
230count% = CODE%+4 :REM number of copies location
240name% = CODE%+5   :REM name of file location
250FOR OPT% = 0 TO 3 STEP 2
260P% = CODE%
270[OPT OPT% : .data% : ]
280?P% = (count% MOD 256)
290P%?1 = (count% DIV 256)
300P%?2 = &0B
310P%?3 = &20
320P%?4 = &7E          :REM set up OSWORD data block
330P%=P%+16
340[OPT OPT% : .emess% : ]
350?P%=&0D : $P% = "RORRE LOOPS"
360message% = P% + 5     :REM spooler messages
370P% = P% + 12
380[ OPT OPT% : .SPOOL%
390                    LDA #&0C
400                    JSR OSWRCH   \ clear the screen
410                    LDX #5
420          .mout%    LDA message%,X
430                    JSR OSWRCH
440                    DEX
450                    BPL mout%     \ output prompt
460                    LDY #(CODE% DIV 256)
470                    LDX #(CODE% MOD 256)
480                    LDA #0
490                    JSR OSWORD   \ input spool command
500                    LDA count%
510                    SEC
520                    SBC #&30
530                    STA count%       \ correct count to ab
solute
540                    LDA #0
550                    STA channel% \ clear channel number

560                    JSR store_vect%  \ store original v
ectors and activate spooler
570                    RTS              \ end of spooler initi
alisation
580         .entry%    PHA              \ entry to main routin
e
590                    TXA
600                    PHA
610                    TYA
620                    PHA              \ stack processor statu
s
630                    JSR reset% \ deactivate spooler
640                    LDY channel%
650                    BNE main%    \ branch if channel act
ive
660                    LDX count%
670                    BEQ alt_exit%  \ branch if finished

680                    DEX
690                    STX count%     \ decrement count
700                    LDY #(name% DIV 256)
710                    LDX #(name% MOD 256)
720                    LDA #&C0
730                    JSR OSFIND      \ attempt to open fi
le
740                    STA channel%  \ store channel numb
er
750                    CMP #0
760                    BEQ error%      \ branch if file uno
penable
770         .exit%     JSR setvec%    \ exit with spooler
active
780     .alt_exit% PLA              \ exit eith spooler
inactive
790                    TAY
800                    PLA
```

(listing continued on page 133)

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(continued from page 130)

any changes would be impossible. By changing the address given in the RAM part the routine can be redirected to the spool routine before being allowed to continue with its original task.

The code itself is in two parts. I will not give a complete description as the code is annotated. It is in two sections. The first part initialises the system by clearing the screen and then outputting the message Spool. It then uses Osword to input the command into its own memory space. The number of copies now stored at location Count% is converted from ASCII to absolute. The current channel number is set to zero, the vector stored and the vector set.

The OSWRCH routine vectors through location &20E/&20F usually labelled as WRCHV. The contents of this location are copied to a location labelled Storevect. WRCHV can now be changed to point to our own routine labelled by the variable Entry%. With the vector set OSWRCH will indirect to our own routine which will terminate with a jump to the address stored in Storevect.

The initialising routine now returns control to the host system. The next time OSWRCH is used the actula routine which performs the spooling will be activated.

This routine commences by storing the accumulator, X and Y registers on the stack, and terminates by unstacking the information and jumping to the main OSWICH routine via Storevect. In the interim OSWRCH will have to be used to output characters to the printer. If the vector was still active then it would reenter the spool routine. A recursive situation which would never terminate !. To cope with this the vector is restored after the registers have been stacked and in most cases is set before exit. If the spooling is finished or an error has been detected then the exit is made without setting the vector, leaving the spooler inoperative.

To perform the spooling the routine first establishes if a file is active by examining the current channel number. Zero indicates that a file is not active and any other number should indicate an active file. If no file is active then one is opened, using Osfiel the channel number stored and the document count decremented. If the counter reaches zero then all copies have been spooled and the vector is left unset on exit.

If a file is active then the routine labelled Main% will obtain the next character using OSBGET and send it directly to the printer. Error conditions can occur if the file cannot be opened or a character cannot be obtained from the file these are delt with in the routine labelled Error%.

The end of file is determined by OSBGET returning with the accumulator containing &FE and the carry bit set. This causes Channel% to be set to zero indicating no file is open and a form feed is sent to the printer.

Errors detected by the spooler will result in the message "Spool Error" being printed by the printer and a form-feed. The spool routine is exited without the vector being set so the spooler is left inactive. Operating system errors are met with the vector reset also and will display an operating system error message.

(listing continued from page 130)

```
  810              TAX
  820              PLA               \ unstack processor
status
  830              JMP (STOREVECT)   \ jump to usual OS
WRCH routine
  840     .main%   JSR OSBGET
  850              STA temp%         \ get and store one
byte
  860              BCS qerror%       \ carry set indicate
s error
  870              JSR print_on%
  880              LDA temp%
  890              JSR OSWRCH        \ send one byte to p
rinter
  900              JSR print_off%
  910              JMP exit%         \ exit with vector s
et
  920    .qerror%  CMP #&FE
  930              BNE error%        \ branch if not EOF
  940              JSR print_on%
  950              LDA #form_feed%
  960              JSR OSWRCH        \ print form feed
  970              JSR print_off%
  980              LDY channel%
  990              LDA #0
 1000              STA channel%      \ clear channel numb
er
 1010              JSR OSFIND        \ close file
 1020              JMP exit%
 1030    .error%   JSR print_on%
 1040              LDA #&0D
 1050              JSR OSWRCH        \ print channel numb
er
 1060              LDX #&0C
 1070    .emout%   JSR print_on%
 1080              LDA emess%,X
 1090              JSR OSWRCH
 1100              DEX
 1110              BPL emout%
 1120               JSR print_off%       \ print error
 message
 1130              JMP alt_exit%
 1140   .print_on% LDA #02
 1150              JSR OSWRCH
 1160              LDA #01
 1170              JSR OSWRCH
 1180              RTS               \ send next OSWRCH c
all to printer
 1190 .print_off%  LDA #03
 1200              JSR OSWRCH
 1210              RTS               \ wally trap
 1220.store_vect%  LDA WRCHV
 1230              STA STOREVECT
 1240              LDA WRCHV+1
 1250              STA STOREVECT+1    \ store original v
ector and
 1251                                 \ continue by sett
ing vector
 1260    .setvec%  LDA #(entry% MOD 256)
 1270              STA WRCHV
 1280              LDA #(entry% DIV 256)
 1290              STA WRCHV+1
 1300              RTS   \ set vector for spooler
 1310    .reset%   LDA STOREVECT
 1320              STA WRCHV
 1330              LDA STOREVECT+1
 1340              STA WRCHV+1
 1350              RTS   \ restore original
 1360 ]
 1370 NEXT
 1380 STOP
 1390 CALL SPOOL%
 1400 STOP
```



THE MICRODRIVE FILE

Kathleen Peel with more on Sinclair's Microdrive.

MY PLANS FOR LAST month's Microdrive File were thrown into confusion when I became aware of another version of the Microdrive ROM.

At the time, it was assumed to be the finished ROM which would supersede the EPROM of the early Microdrives and remove some of the bugs. As you can imagine, I was not too keen to continue with the possibility of changes to calls in the programs depending upon which version of the Microdrive the reader had.

Fortunately in one way, the new ROM was in fact, meant for an entirely new product, the QL. This in itself has raised a new set of difficulties, the problem now becomes one of non-interchangeability between cartridges 'formatted' and 'written to' by the different ROM operating systems.

Do we just ignore the problem and accept that the files, data programs etc. can not be mixed or do we take the minimal step of at least writing the new commands in such a way as to enable programs to be networked?

This means that the rather long winded Microdrive save routines could be changed from:

SAVE*'m';1;'file-name'

to either,

*1S'file-name'

or

SAVE MDV1—file-name—1

for the QL the MDV1 is not necessary, but if left out the command would refer to a cassette save on the Spectrum.

The use of the later style of command completely negates the reason for writing new commands in the first place, i.e., to simplify

(continued on next page)

Figure 1. "Free memory" program listing.

```
   1 PRINT AT 10,7;"REMOVE CARTRIDGE": P
AUSE 15: LET a$=INKEY$: IF INKEY$="" THE
N  GO TO 1
   2 CLEAR 65535: GO SUB 9931
 100 FOR a=(PEEK 23735+256*PEEK 23736)-5
 TO 65535: PRINT a,PEEK a: NEXT a: STOP
 500 ERASE "m";1;"uprog": SAVE *"m";1;"u
prog": CAT 1: STOP
9931 DEF FN t(s)=PEEK s+256*PEEK (s+1):
LET s=23730: LET nt=FN t(s)-80: CLEAR nt
: RESTORE 9934: LET s=23730: LET nt=FN t
(s): LET rt=nt+80: LET h=INT (nt/256): L
ET l=nt-256*h: IF rt<=FN t(s+2)-2 THEN
IF PEEK (rt+2)=42 AND PEEK (rt+3)=42 THE
N  POKE (rt+10),l: POKE (rt+11),h: GO TO
 9933
9932 POKE 23736,h: POKE 23735,l+4
9933 POKE (s+1),h: POKE s,l: FOR a=1 TO
80: READ d: POKE (nt+a),d: NEXT a: RETUR
N
9934 DATA 42,42,0,215,24,0,254,245,194,2
40,1,215,32,0,254,42,40,2,231,0,215,32,0
,205,183,5
9936 DATA 215,26,31,42,178,92,237,66,68,
77,215,43,45,215,227,45,195,193,5
9937 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
9938 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
9995 CLOSE #3: FORMAT "t";600: OPEN #3;"
t": RETURN
```

Figure 2.

**NOP	42 42 0	Routine Marker	DEF W	0	Non sense in Basic
CALL NN	215 24 0	Get Char routine old ROM	CALL NN	215 32 0	Check last expression
CP 'PRINT'	254 245	Is char 'PRINT'	CALL NN	205 183 5	SYNTAX CHK return
dP NZ ERR	194 240 1	No Jump original vector	CALL NN	215 26 31	Bytes in Use in BC
		address.	LD HL (RAMTOP)	42 178 92	Get RAMTOP
CALL NN	215 32 0	call next char routine of	SBC HL BC	237 66	Get Spare in HL
		ROM	LD 8 H	68	then into BC
CP '*'	254 42	Is char '*'	LD C L	77	
JR Z DIS	40 2	Jump	CALL STK-BC	215 43 45	Place on stack
RST 32	231	Call new ROM Error	CALL PRNT-FP	215 227 45	PRINT
		Routine	JP END	195 183 5	EXIT OK message.

(continued from previous page)

data entry.

In writing this month's article, it has become apparent that certain precautions need to be taken when writing machine code routines for use with the Microdrives.

The problem lies in the fact that it is possible to erase all your hard work by a couple of accidental Pokes. I have therefore amended the Basic program to include a warning to remind you to remove the microdrive cartridge before testing a new routine.

This month I have produced a very simple "memory free" command that will enable me to explain two of the problems encountered in producing this type of command as opposed to the graphics command of the previous article.

Figure 1 is the Basic program listing and figure 2 the annotated listing. I have chosen the command

PRINT *

to provide the 'memory left function'.

The items of note are as follows:

The last jump used in the run time section is the new ROM O'K error message. Without this, all sorts of messages can be printed which are irrelevant when the command is used in the direct mode.

Changing the format to

*f

will provide a value of free memory, but it is printed in the last used print position, which if the command is typed in directly, is the input area and so it is overwritten by the next system message.

One way round ths is to use the command in a line i.e.

```
10 PRINT AT 0,0, ' ':*f:STOP
```

As you will have noticed, this part of the Microdrive File is rather short, so I will add a couple of points of more general interest.

I have lately seen a number of solutions to the monitor problem of the Spectrum. These generally involve making the Vid link on the PCB near the modulator, invalidating the guarantee.

One of the side effects of making the link on the Spectrums I have is a reduction in output level through the normal TV outlet, this generally shows up as loss of colour on the more sensitive TV's.

An alternative solution you might like to try is the use of the 0V and Y connections — Page 180 of the manual. These work well on my monochrome monitor and a MK2 Spectrum and do not affect the normal TV output. The connection can be made on a rear expansion plug which does not entail opening the Spectrum and invalidating the guarantee.

All program development is done on the monitor and the program run on a normal TV to check colour operation. It's a lot easier on the eyes without ghosting, shimmer and dot crawl.

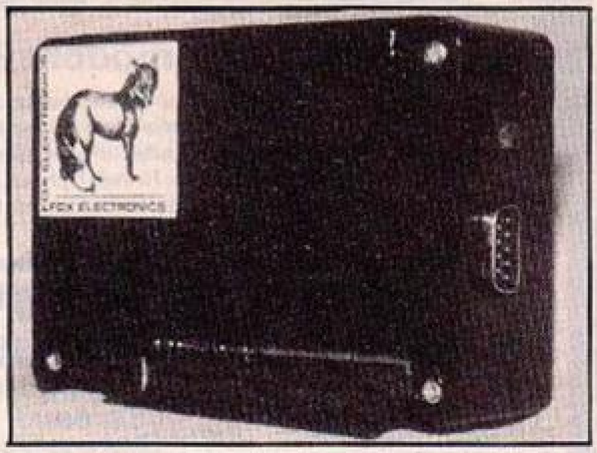
Interface 2 does not take the video connections though. This means that to get video quality from the cartridge software, it is necessary to use a double ended connector between the Interface and the computer, further increasing the likelihood of the dreaded wobbles.

The Microdrive wallet is expected to be available sometime in the summer, at present there is no indication of price. ■

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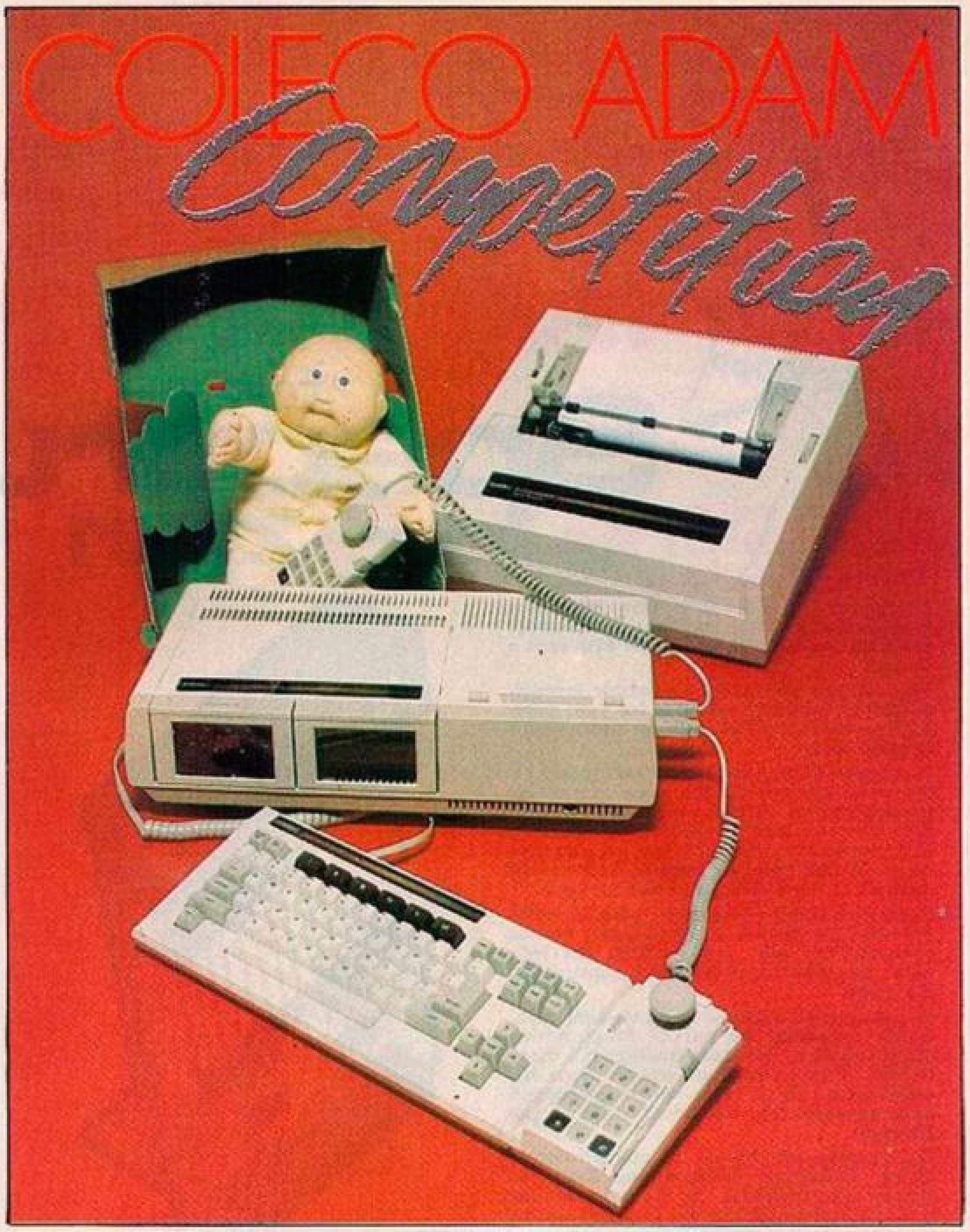
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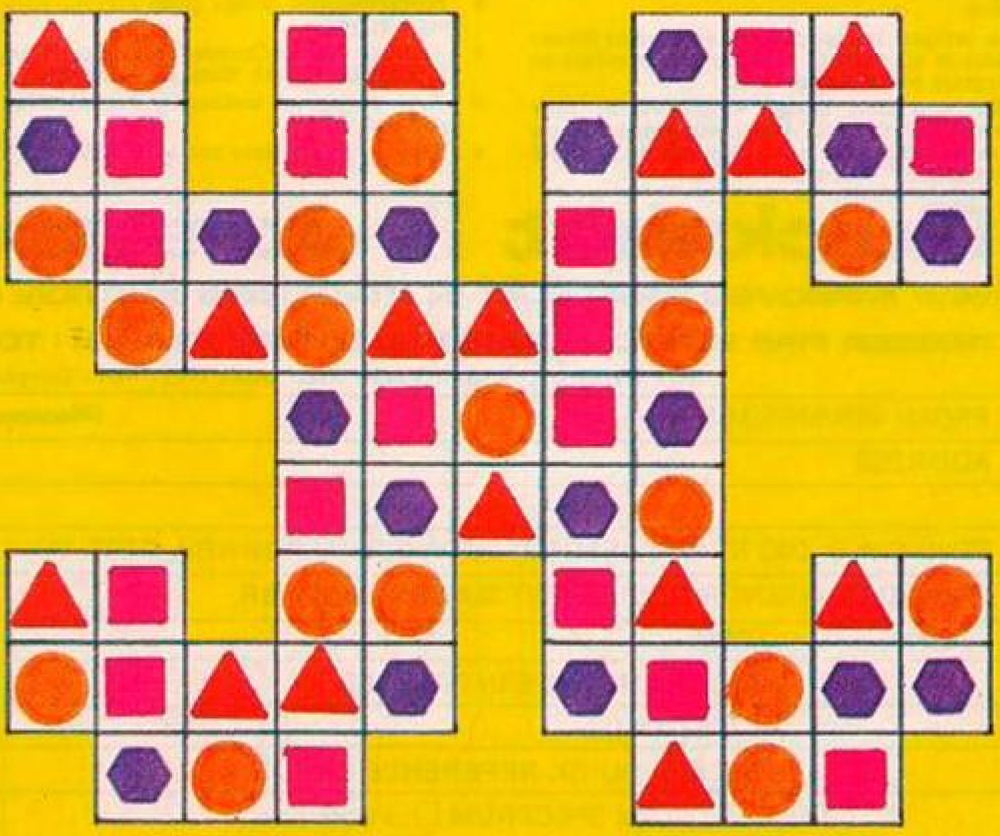
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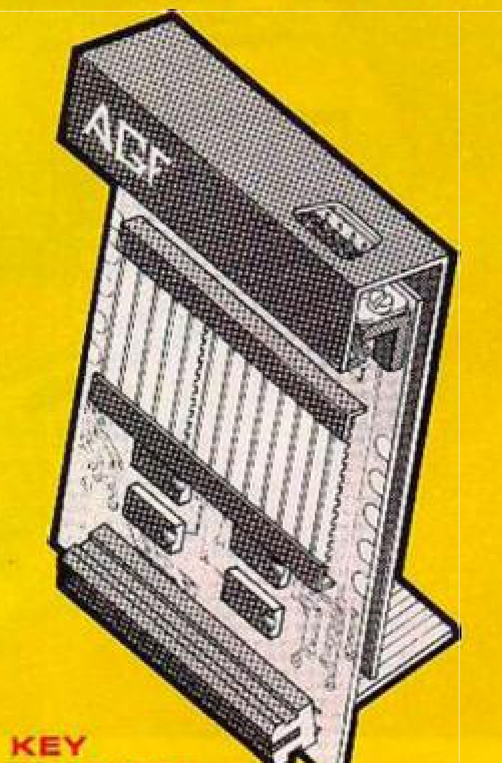
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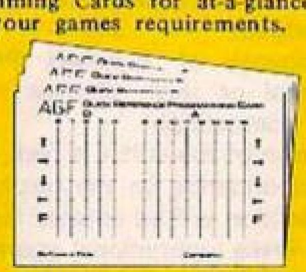
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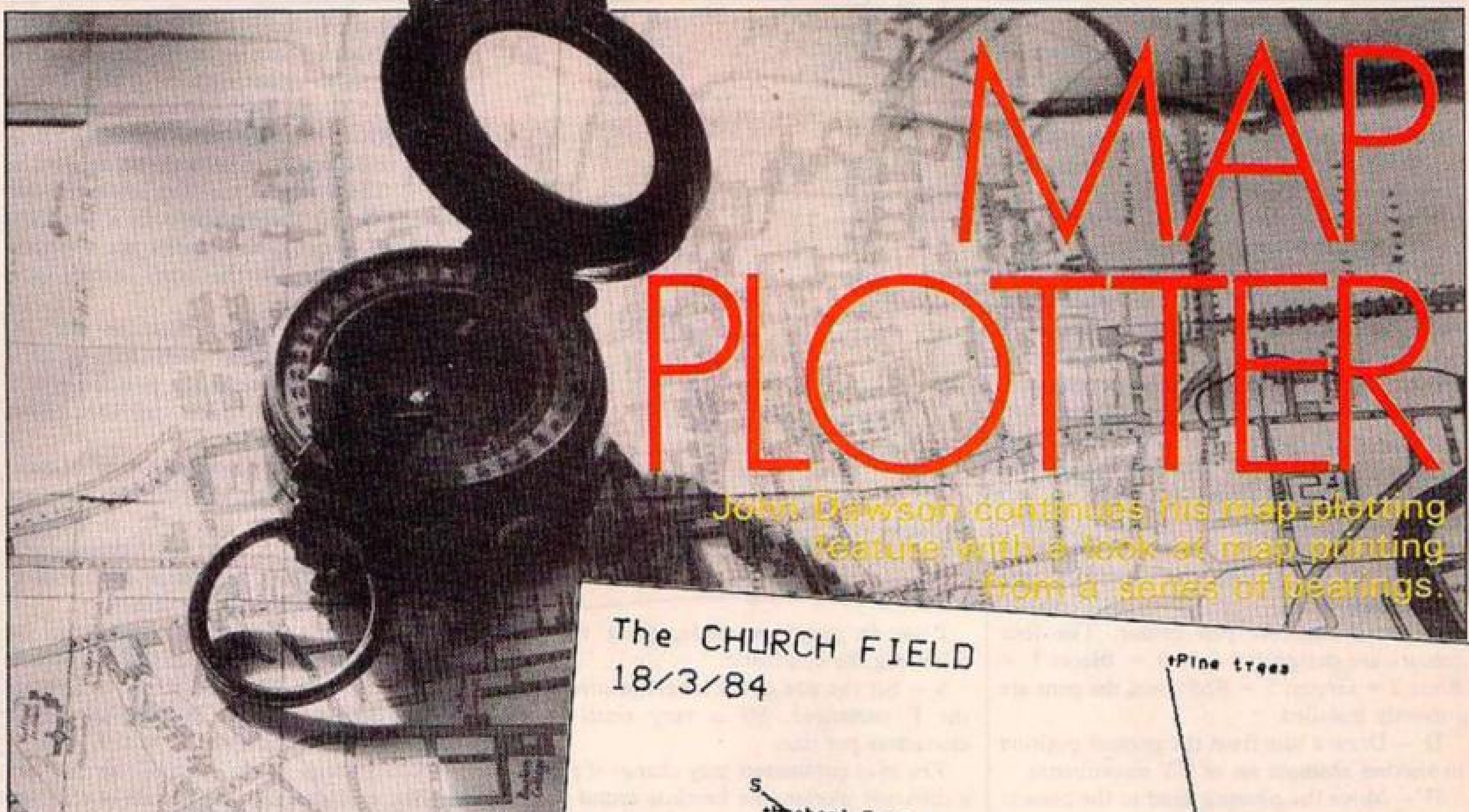
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MAP PLOTTER

John Dawson continues his map-plotting feature with a look at map printing from a series of bearings.

THE PROGRAM listed in figure 1 will plot a chart or map from a series of bearings. I have rewritten and extended the plane tabling program, given last month, to use the Oric four-colour printer with the BBC micro for map plotting. The program can be used with other XY plotters with some modifications.

Before you can plot anything on the Oric plotter/printer using the BBC Micro you will have to overcome the printer's non-standard socket. I decided that I wanted to be able to use the printer with a number of microcomputers and so I separated the case by removing five Philips screws from the underside.

The main printed-circuit board has connections for two sockets and it is not difficult to disconnect the Oric socket and replace it with a standard Centronics one. You will have to unsolder the old socket and solder in the replacement so don't start unless you are sure it will go smoothly — the conversion will invalidate your guarantee.

The Oric printer will work as a normal 40-column printer with the BBC when you have finished the conversion, and you should check this by listing a program in the usual way. Other equivalent versions of the printer — the Tandy four-colour printer/plotter, for example — may well not need modifying.

The program works by accepting up to 50 entries into the array OB$. Each entry consists of the name of the object, the bearings from two observation points, and a "Chainlink" entry. I will describe the Chainlink entry later on. The name of the object is stored in OB$ (0,n), the first bearing in OB$ (1,n) and so on.

Typing Q or q when you are asked for an object exits from this part of the program and you are asked if you wish to save the array on tape. PROCtapesave stores the array on tape and PROCtaperead will recall its contents.

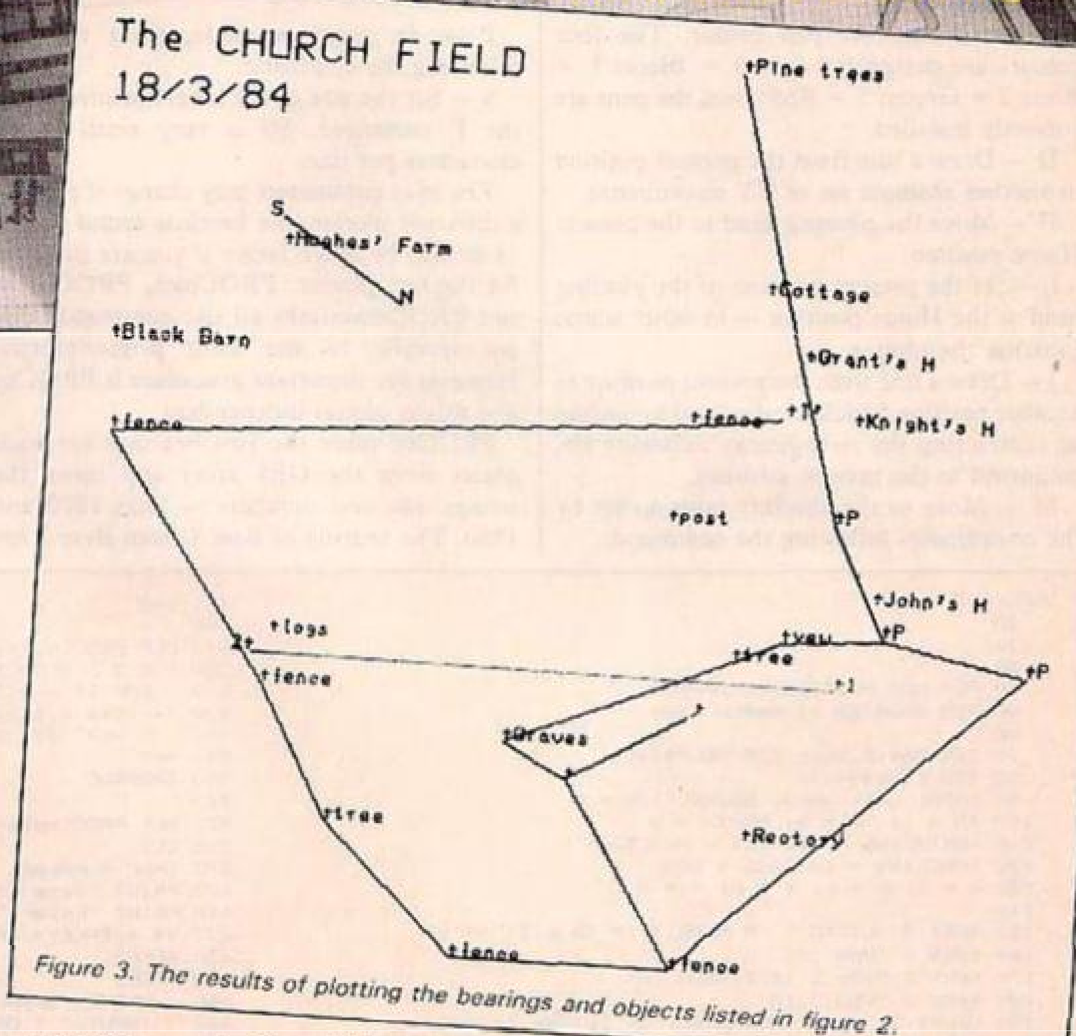


Figure 3. The results of plotting the bearings and objects listed in figure 2.

The function to add bearings to the array does not clear the array; it appends the readings that you enter to anything that is already in the array. PROCclear checks that you really wish to erase the current contents and then makes a fresh start.

When you have entered a series of bearings, you can list them to the screen or to a printer. Different procedures are used for each purpose and PROClist uses a For — Next loop inside a Repeat — Until loop to page the entries in the array — 20 items are displayed and the program stops and says "Press any key for the next page" in line 1250. When a key is pressed the screen is cleared and further entries are displayed. The procedure to print the array to a printer outputs the Chainlink entries as well as any information entered.

Figure 2 shows a typical array printout. The first column is the position of the item in the array; the second is the name of the object; the third is the bearing from the first observation point, the fourth is the bearing from the second observation point and the final column is the Chainlink entry.

You can see that some of the items are linked by letters in the final column. When the map is plotted, lines will be drawn linking the objects that have a common letter in the Chainlink entry. Objects 6, 15, 16, 17 and 19 are all linked by the letter g for example. The link line is drawn from the lowest numbered entry to the next highest number and so on.

I wanted the "r" link to include the point at item 14 but it was more convenient to re-enter the point at item 25 than to try to edit the array. The procedure for editing the array is

(continued on next page)

(continued from previous page)

very primitive and could be improved enormously by using some of the procedures listed in the Heartstop series. You have to enter .E. to escape from the editing routines when the program asks you for a new entry — lines 2520 and 2530.

The following Oric printer commands are used in this program:

VDU 1,17 sends a control character to make the printer output text. The manual incorrectly says that the number of characters per line is fixed by an internal switch in the printer. The switch is wired permanently inside the case and the number of characters per line is altered by the S code in graphics mode. The setting you establish in graphics mode remains in force on return to text mode.

VDU 1,18 sends the control character 18 decimal to the printer to switch it into graphics mode.

C — Change the pen colour. The four colours are designated 0-3; 0 = Black; 1 = Blue; 2 = Green; 3 = Red when the pens are correctly installed.

D — Draw a line from the present position to another absolute set of XY co-ordinates.

H — Move the plotting head to the present Home position.

I — Set the present position of the plotting head as the Home position — in other words initialise the plotter.

J — Draw a line from the present position to another position which is calculated by adding or subtracting the co-ordinates following the command to the present position.

M — Move to the absolute position set by the co-ordinates following the command.

```
 0  John's H
 1  Knight's H                    260  320
 2  Grant's H                     239  304   ..
 3  Cottage                       230  297   ..
 4  T'                            225  290   ..
 5  P                             225  301   ..
 6  P                             320  326   f
 7  P                             278  323   d
 8  Pine trees                    235  312   dg
 9  fence                         226  275   d
10  fence                         206  297   d
11  fence                         164  202   f
12  tree                          145  36    f
13  fence                         130  30    f
14  fence                         110  21    f
15  yew                           85   1     f
16  tree                          189  323   f
17  Graves                        162  325   g
18                                136  343   g
19                                135  332   g
20  logs                          126  346   r
21  Hughes' Farm                  150  281   rg
22  Black Barn                    183  239   ..
23  Rectory                       170  210   ..
24  post                          85   345   ..
25                                190  307   ..
26                                85   1     ..
                                  320  326   r
                                             r
```

Figure 2. Current items in the bearing array.

P — In graphics mode, print the text following the command.

S — Set the size of the letters printed using the P command. S0 is very small — 80 characters per line.

The map parameters may change if you use a different plotter, the baseline found in line 1430 may be much larger if you are using an A4 flat-bed plotter. PROCplot, PROCnorth and PROCmakelinks all use commands that are specific to the Oric printer/plotter. However the important procedure is PROCxy and this is plotter-independent.

PROCxy takes the two bearings for each object from the OB$ array and turns the strings into real numbers — lines 1870 and 1880. The bearing of Base 1 from Base 2 has been stored previously in NDirection and this is subtracted to bring the bearings to a correct magnetic north orientation.

Lines 1890 and 1900 use the bearings and the length of the baseline to calculate the X and Y co-ordinates of each object relative to Base 1. These figures are then converted into absolute X and Y co-ordinates by Lines 1910 and 1920. Finally, the results are stored in two further slots in the array in the same lines.

Line 1780 takes the absolute XY co-ordinates and outputs them to the Oric plotter. Line 1790 marks the position with a + and prints the name of the object immediately afterwards.

The baseline lies across the map because angles near the line between the two bases are difficult to calculate and tend to produce inaccurate results. A very small alteration in the bearing makes a very large difference in the apparent position of the object.

The scale of the map will depend on the distance from the base stations of the objects that you measure. The field shown in figure 3 is about 300 yards across the long axis and it was plotted with the scale set to 0.9.

If you attempt to set the scale so that the baseline is longer than the X axis of the map the program will clear the screen and ask you to input the scale again — lines 1410 and 1420.

When you set up the Chainlinks that you want before plotting a map, you are asked for the link, which must be the same character as you have entered into the array, and then the colour which is to be used for the plot. You should enter 0, 1, 2, or 3 to select the colour that you want.

Figure 1.

```
 10
 20
 30
 40 REM MAP PLOTTING PROGRAM - 2
 50 REM STARTED 11 MARCH 1984
 60
 70 DIM OB$(5,50): DIM HELP$(10)
 80 DIM LINK$(9,1)
 90 P=20: L=1: NN=0: NDIRECTION = 0
100 XN = 0: YN = 0: NORTH = 0
110 NORTHLINE = 75: LS1 = 0: LS2 = 0
120 BASELINE = 0: BASE = 300
130 A = 0: B = 0: X = 0: Y = 0
140
150 *KEY 9 "LISTO 7 |M MODE 7 |M |N LIST |M"
160 *KEY 0 "RUN |M"
170 *KEY 2 "VDU 2 |M *FX6,0 |M"
180 *KEY 3 "VDU 3 |M"
190 HELP$(0) = "A  Add bearings to the array"
200 HELP$(1) = "C  Clear the array for a fresh start"
210 HELP$(2) = "E  Edit an item in the array"
220 HELP$(3) = "L  List the items in the array"
230 HELP$(4) = "P  Plot a map "
240 HELP$(5) = "Q  Quit MAP PLOTTER to BASIC"
250 HELP$(6) = "R  Read bearings array from tape"
260 HELP$(7) = "?  HELP - Display this screen"
270
280 PROCinitialise
290
300 REPEAT
310   CLS
320   PRINT TAB(7,20); "MAP PLOTTING PROGRAM"
330   PRINT TAB(0,22); "Press ? for help or enter command
";
340   REPEAT
350     K$ = INKEY$(10)
360     UNTIL K$ <> ""
370   IF K$ = "A" THEN PROCadd
380   IF K$ = "C" THEN PROCclear
390   IF K$ = "E" THEN PROCeditarray
400   IF K$ = "L" THEN PROClist
410   IF K$ = "P" THEN PROCplotmap
420   IF K$ = "?" THEN PROChelp
430   IF K$ = "T" THEN PROCtestplot
440   IF K$ = "R" THEN PROCtaperead
450   UNTIL K$ = "Q"
460 CLS
470 END
480
490 DEF PROCinitialise
500 FOR Z = 0 TO 5
510   FOR ZZ = 0 TO 50
520     OB$(Z,ZZ) = "*"
530     NEXT ZZ: NEXT Z
540 N=0
550 ENDPROC
560
570 DEF PROCtypein
580 CLS
590 ENDF = FALSE
600 PRINT "Type in object name and bearings"
610 PRINT "Enter 'Q' or 'q' to finish entering data"
620 Y$ = INKEY$(500)
630 REPEAT
640   CLS
650   PRINT "Object  ";N+1;
660   INPUT " " OB$(0,N)
670   IF OB$(0,N) = "Q" THEN ENDF = TRUE: GOTO 770
680   IF OB$(0,N) = "q" THEN ENDF = TRUE: GOTO 770
690   IF OB$(0,N) = "" THEN OB$(0,N) = " "
700   INPUT "Bearing 1 " OB$(1,N)
710   IF OB$(1,N) = "" THEN 700
720   INPUT "Bearing 2 " OB$(2,N)
730   IF OB$(2,N) = "" THEN 720
740   INPUT "Chainlink " OB$(5,N)
750   IF OB$(5,N) = "" THEN OB$(5,N) = ".."
760   N=N+1
770   UNTIL N>=50 OR ENDF = TRUE
780 ENDPROC
790
800 DEF PROCadd
810 PROCtypein
820 PRINT TAB(0,10); "Save the array on tape <Y> ";
830 INPUT " " Y$
840 IF Y$ = "Y" THEN PROCtapesave ELSE ENDPROC
850 ENDPROC
860
870 DEF PROCclear
880 CLS
890 INPUT "Are you SURE you want to" ' "wipe out the array
 <!> " Y$
900 IF Y$ <> "!" THEN ENDPROC
910 PROCinitialise
920 PROCadd
930 ENDPROC
```

(continued on page 144)

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```
 940
 950 DEF PROChelp
 960 CLS
 970 PRINT TAB(0,5): "HELP INSTRUCTIONS"
 980 PRINT: PRINT
 990 FOR H= 0 TO 10
1000   PRINT HELP$(H)
1010   NEXT H
1020 Y$ = INKEY$(1000)
1030 IF Y$ = "?" THEN PROChelp
1040 ENDPROC
1050
1060 DEF PROClist
1070 CLS
1080 PRINT TAB(5,10);
1090 INPUT "Display on printer <Y> " Y$
1100 IF Y$ <> "Y" THEN 1130
1110 PROCprintarray
1120 ENDPROC
1130 ENDF = FALSE
1140 CLS
1150 PRINT "CURRENT ITEMS IN THE BEARINGS ARRAY"
1160 NN=0
1170 REPEAT
1180   FOR L= 2 TO P
1190     PRINT TAB(0,L) OB$(0,NN);
1200     PRINT TAB(25,L) OB$(1,NN);
1210     PRINT TAB(33,L) OB$(2,NN);
1220     IF NN >= N-1 THEN ENDF = TRUE: GOTO 1260
1230     NN = NN+1
1240     NEXT L
1250   PRINT TAB(0,23); "Press any key for next page ";
1260   REPEAT
1270     Y$ = INKEY$(10)
1280     UNTIL Y$ <> ""
1290   CLS
1300   UNTIL ENDF = TRUE
1310 ENDPROC
1320
1330 DEF PROCplotmap
1340 PROCmapparameters
1350 PROCplot
1360 ENDPROC
1370
1380 DEF PROCmapparameters
1390 CLS
1400 PRINT TAB(0,10): "Enter scale";
1410 INPUT " " SCALE
1420 IF BASE * SCALE > 480 THEN 1390
1430 BASELINE = BASE * SCALE
1440 PRINT: INPUT LINE "Enter title " TITLE$
1450 PRINT: INPUT "Enter bearing of Base 1 from Base 2 "
NDIRECTION
1460 PRINT: INPUT "Do you want Chainlinks <Y> " Y$
1470 IF Y$ = "Y" THEN PROCchainlink
1480 ENDPROC
1490
1500 DEF PROCplot
1510 VDU 15
1520 VDU 2
1530 VDU 1,18
1540 PRINT "S1"
1550 VDU 1,17
1560 PRINT
1570 PRINT TITLE$
1580 VDU 1,18
1590 PRINT "C0"
1600 PRINT "D0,-600"
1610 PRINT "I"
1620 PRINT "D479,0"
1630 PRINT "D479,600"
1640 PRINT "D0,600"
1650 PRINT "S0"
1660 PROCnorth
1670 PRINT "C2"
1680 PRINT "M";STR$(230-(BASELINE/2));",300"
1690 PRINT "P2+"
1700 PRINT "M";STR$(240-(BASELINE/2));",300"
1710 PRINT "J";STR$(BASELINE);",0"
1720 PRINT "P+1"
1730 XREF = 240+(BASELINE/2)
1740 YREF = 300
1750 PRINT "C0"
1760 FOR NN = 0 TO N-1
1770   PROCxy
1780   PRINT "M";OB$(3,NN);",";OB$(4,NN)
1790   PRINT "P+";OB$(0,NN)
1800   NEXT NN
1810 PROCmakelinks
1820 PRINT "H"
1830 VDU 3
1840 ENDPROC
1850
1860 DEF PROCxy
1870 A = EVAL(OB$(1,NN))-NDIRECTION
1880 B = EVAL(OB$(2,NN))-NDIRECTION
1890 Y = (BASELINE * SIN(RAD(A)) * SIN(RAD(B))) /
SIN(RAD(180-B-(180-A)))
1900 X = -Y * (1/TAN(RAD(A)))
1910 OB$(3,NN) = STR$(INT(XREF-X))
```

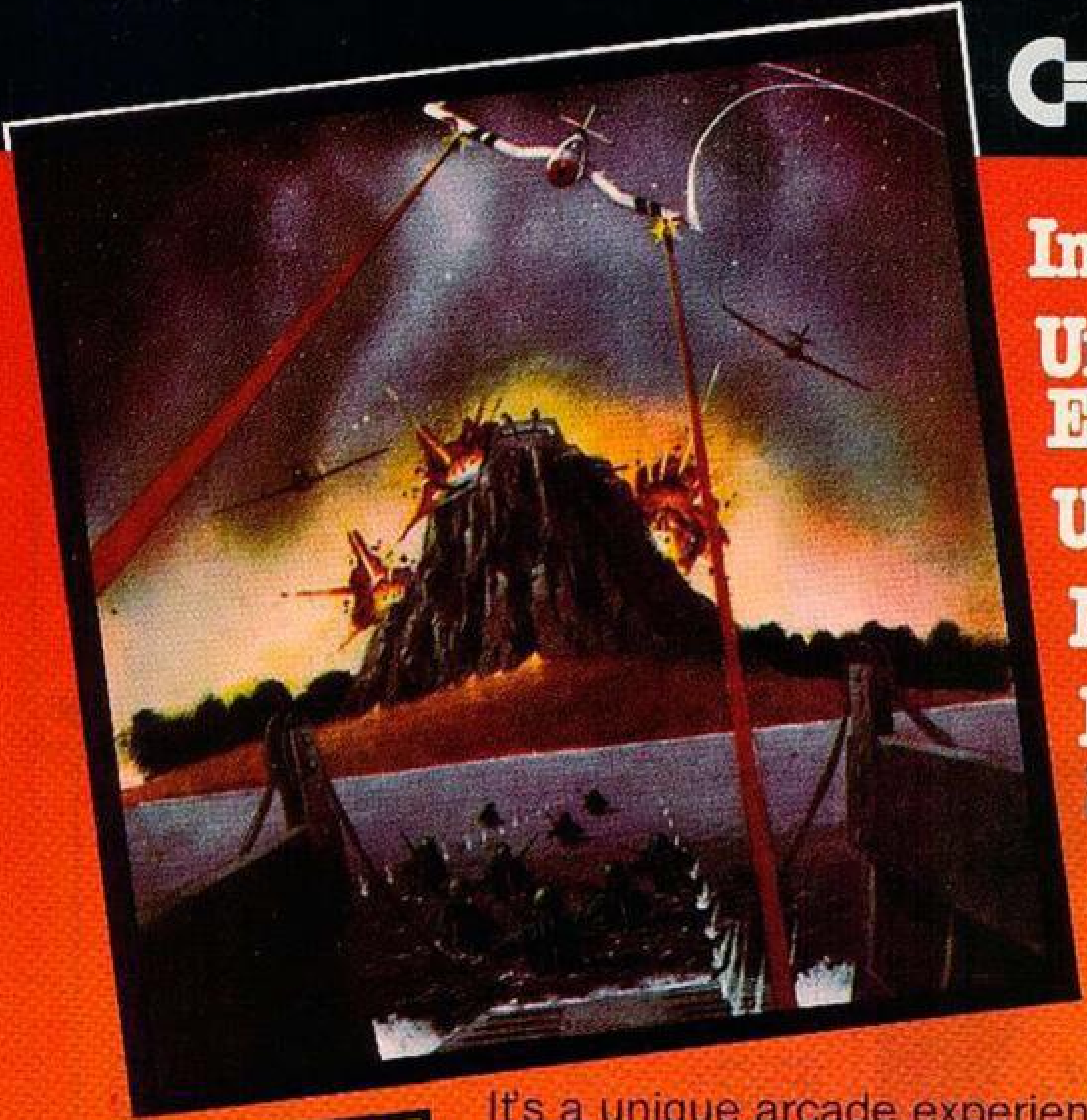
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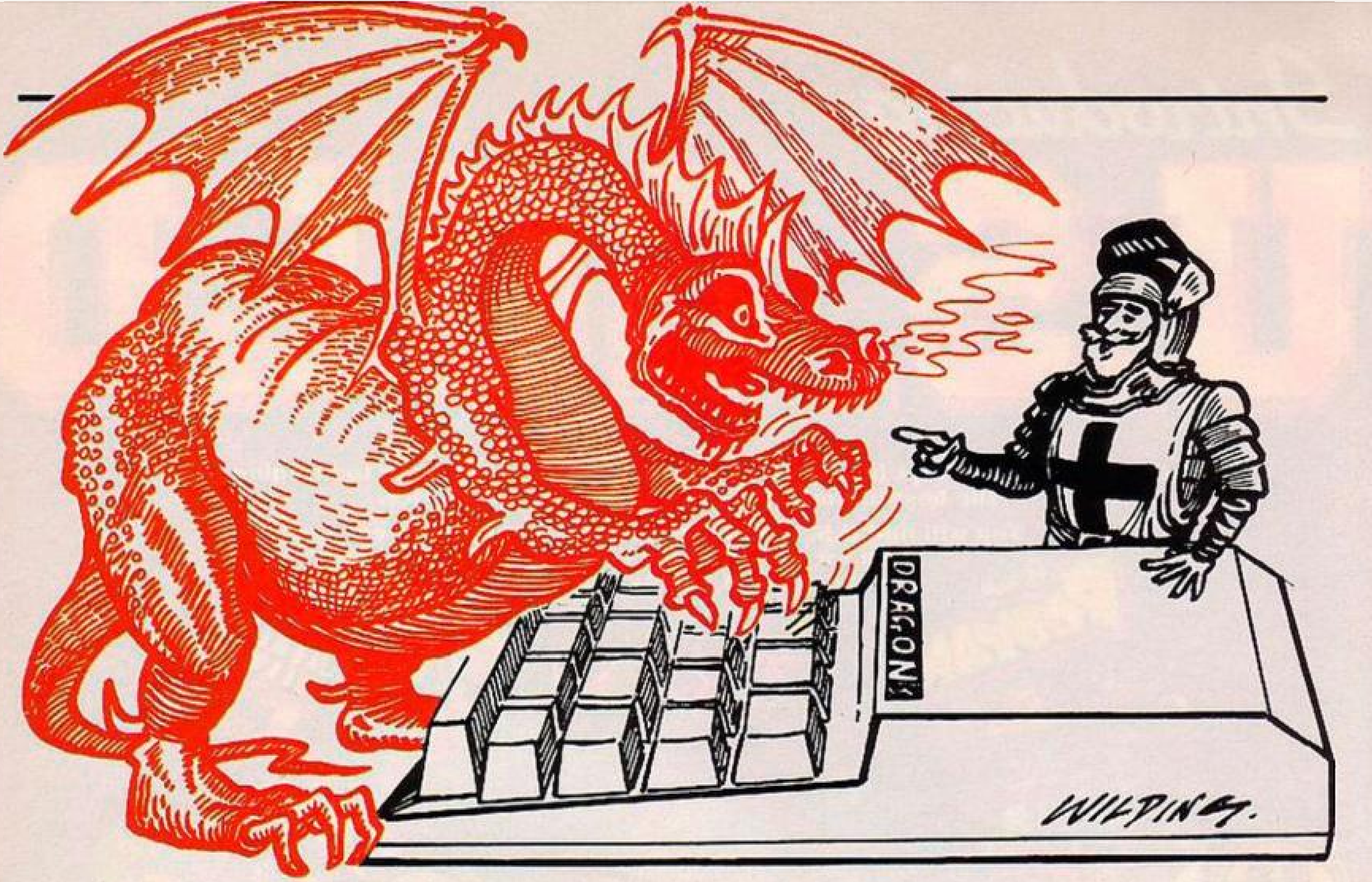
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(continued from page 144

```
1920 OB$(4,NN) = STR$(INT(YREF-
1930 ENDPROC
1940
1950 DEF PROCprintarray
1960 VDU 2
1970 *FX6,0
1980 PRINT TAB(15); "CURRENT ITEMS IN THE BEARING ARRAY"
1990 PRINT STRING$(70,"-")
2000 FOR NN = 0 TO N-1
2010    PRINT NN; "   "; OB$(0,NN);
2020    PRINT TAB(35);OB$(1,NN), OB$(2,NN), OB$(5,NN)
2030    NEXT NN
2040 VDU 3
2050 ENDPROC
2060
2070 DEF PROCnorth
2080 IF SCALE >= 1.0 THEN 2100
2090 NORTH = NORTHLINE * SCALE
2100 PRINT "C3"
2110 PRINT "M";STR$(1.5*NORTH);",";STR$(600-(1.5*NORTH))
2120  PRINT "PS"
2130 XN = INT(NORTH * COS(RAD(NDIRECTION)))
2140 YN = INT(NORTH * SIN(RAD(NDIRECTION)))
2150 PRINT "J";STR$(XN);",";STR$(YN)
2160 PRINT "PN"
2170 ENDPROC
2180
2190 DEF PROCtapesave
2200 X=OPENOUT("BEARINGS")
2210 FOR J = 0 TO N
2220    FOR K = 0 TO 5
2230       PRINT#X,OB$(K,J)
2240       NEXT K
2250    NEXT J
2260 CLOSE#X
2270 ENDPROC
2280
2290 DEF PROCtaperead
2300 CLS
2310 PRINT TAB(0,10); "Start tape ... ";
2320 J = N
2330 X=OPENIN("BEARINGS")
2340 REPEAT
2350    FOR K = 0 TO 5
2360       INPUT#X,OB$(K,J)
2370       NEXT K
2380    J = J + 1
2390    UNTIL EOF#X
2400 CLOSE#X
2410 N = J - 1
2420 ENDPROC
2430
2440 DEF PROCeditarray
2450 REPEAT
2460    CLS
2470    PRINT TAB(0,10); "Enter the number of the
entry"'"that you want to modify "
2480    INPUT " " K
2490    PRINT STR$(0),STR$(1),STR$(2),STR$(5): PRINT
2500    PRINT OB$(0,K),OB$(1,K),OB$(2,K),OB$(5,K)
2510    PRINT: INPUT "Enter array element " J
2520    PRINT: INPUT "Type in new entry " L$
2530    IF L$ <> ".E." THEN OB$(J,K) = L$
2540    UNTIL L$ = ".E."
2550 ENDPROC
2560
2570 DEF PROCchainlink
2580 CLS
2590 INPUT "How many links do you want " LS
2600 IF LS > 9 THEN 2580
2610 FOR LS1 = 1 TO LS
2620    PRINT STR$(LS1);: INPUT " Link " LINK$(LS1,0)
2630    INPUT "   Colour (0-3) " LINK$(LS1,1)
2640    NEXT LS1
2650 PRINT: PRINT "Are these entries correct (Y) ";
2660 INPUT " " Y$
2670 IF Y$ <> "Y" THEN 2580
2680 CLS
2690 ENDPROC
2700
2710 DEF PROCmakelinks
2720 FOR LS1 = 1 TO LS
2730    LS2 = 0
2740    Y$ = LINK$(LS1,0)
2750    IF Y$ = "" THEN 2780
2760    YY = INSTR(OB$(5,LS2),Y$)
2770    IF YY <> 0 THEN GOTO 2800
2780    LS2 = LS2+1
2790    IF LS2 >= N THEN 2880 ELSE 2760
2800    PRINT "C";LINK$(LS1,1)
2810    PRINT "M";OB$(3,LS2);",";OB$(4,LS2)
2820    REPEAT
2830       LS2 = LS2+1
2840       YY = INSTR(OB$(5,LS2),Y$)
2850       IF YY = 0 THEN 2870
2860       PRINT "D";OB$(3,LS2);",";OB$(4,LS2)
2870       UNTIL LS2 >= N
2880    NEXT LS1
2890 ENDPROC
2900
>
```



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EDITOR AND ASSEMBLER

A R Billingham explains his program which provides the Dragon 32 with a combined editor and assembler which, although written entirely in Basic, is reasonably fast and will assemble all of the opcodes that he has encountered.

EDASM IS A COMBINED editor and assembler for the Dragon 32. The assembler is reasonably fast and assembles all the opcodes and addressing modes I have yet encountered.

It is written in Basic so you only need to type in the single listing given here. Remove the Pokes in line 210 if your machine does not have a double speed capability. If the program crashes with an OM error while running change line 80 to

CLEAR 7100,28999

When run the editor will immediately prompt you with 0001] and is ready for input of source code.

The syntax of assembly is:
LABLE [] OPERATION [] DATA
ie. LOOP [] LDX [] #$400
or [] LDX [] #$400
where [] indicates a space. This means that if an instruction has no lable it must be preceded by a space. If the space is omitted then the operation is assumed to be the label and the Data will be considered to be the operation. The editor/assembler will stop at faults of this nature with

OPCODE LINE N

where N is the offending line. To type in a

```
1 CLS0
12 FOR J=0 TO 6
20 FOR I=0 TO 288 STEP 32
30 PRINT@I+J+(32*J),STRING$(24,143+16+(J*16));
40 NEXTI
45 NEXTJ
50 FOR I=231 TO 500 STEP 32
60 PRINT@I,STRING$(24,32);
70 NEXTI
71 PRINT@238,"DRAGON  32";
73 PRINT@298,"EDITOR & ASSEMBLER";
74 PRINT@369,"BY";
75 PRINT@395,"A.R.BILLINGHAM";
76 PRINT@460,"press any key";
79 IF INKEY$=""THEN 79ELSE CLS
80 PCLEAR1:CLEAR7100,28999
90 DIM L$(500)
100 DIM AC$(500)
110 DIM LB$(100)
120 DIM ZZ$(6)
130 QQ=1
140 PRINT RIGHT$("0000"+MID$(STR$(QQ),2),4);:LINEINPUT
"]";L$
150 POKE 65494,0
160 IF L$="EDIT"THEN GOSUB 440:GOTO140
170 IF L$="SAVE"THEN GOSUB 240:GOTO140
180 IFL$="LOAD"THEN GOSUB 330:GOTO140
190 IF L$="SAVEM"THEN LINE INPUT" NAME OF FILE TO SAVE
 ?";NM$:CSAVEMNM$,BA,BL,ST:GOTO140
200 IF L$="LOADM"THEN LINEINPUT" NAME OF FILE TO LOAD
?";NM$:CLOADMNM$:GOTO140
210 IF L$="ASSM"THEN POKE &HFFD7,0:GOSUB1090:POKE 6549
4,0:GOTO140
220 IF L$="TEST"THEN EXEC (ST):GOTO140
230 L$(QQ)=L$:QQ=QQ+1:GOTO140
240 'SAVE
250 LINE INPUT" NAME OF FILE TO SAVE ?";NM$
260 OPEN"O",#-1,NM$
270 FOR I=1 TO 500
280 IF L$(I)=""THEN 320
290 IF LEFT$(L$(I),1)=" "THENA$="X"+MID$(L$(I),2)ELSE
A$=L$(I)
300 PRINT#-1,A$
310 NEXTI
320 QQ=I:CLOSE#-1:RETURN
330 LINEINPUT" NAME OF FILE TO LOAD ?";NM$
340 INPUT"MERGE FILE (Y/N)";M$
350 IF M$="N"THEN S=1:GOTO370
360 FOR I=1 TO 500:IF L$(I)=""THEN S=I:GOTO370ELSE NEX
TI
370 OPEN"I",#-1,NM$
380 FOR I=S TO 500
390 IF EOF(-1)THEN 430
400 INPUT#-1,L$(I)
410 IF LEFT$(L$(I),1)="X"THENL$(I)=" "+MID$(L$(I),2)
420 NEXTI
430 QQ=I:CLOSE#-1:RETURN
440 'EDIT
450 LINE INPUT"COMMAND-";CM$
460 IFLEFT$(CM$,1)="E"THEN RETURN
470 IF LEFT$(CM$,1)="L"THEN GOSUB 530:GOSUB640:GOTO450
480 IF LEFT$(CM$,1)="D"THEN GOSUB 530:GOSUB 680:GOTO45
0
490 IF LEFT$(CM$,1)="A"THEN GOSUB 530:GOSUB 800:GOTO45
0
500 IF LEFT$(CM$,1)="R"THEN GOSUB 530:GOSUB 870:GOTO45
0
510 IF LEFT$(CM$,1)="I"THEN GOSUB980:GOTO450
520 PRINT"COMMAND?":GOTO450
530 L$=MID$(CM$,2)
540 SL=0:EL=0
550 IF SL=0 THEN IF INSTR(L$,",")=0 THEN SL=VAL(L$):EL
=SL
560 IF L$=""THEN SL=1:EL=500
570 IF LEFT$(L$,1)=","THEN SL=1:EL=VAL(MID$(L$,2))
580 IF RIGHT$(L$,1)=","THEN EL=500:SL=VAL(LEFT$(L$,LEN
(L$)-1))
590 IF EL=0 AND SL=0 THEN 600ELSE RETURN
600 PP=INSTR(L$,",")
601 IF PP=0 THEN RETURN
610 SL=VAL(LEFT$(L$,PP-1))
620 EL=VAL(MID$(L$,PP+1))
630 RETURN
640 FOR I=SL TO EL
650 IF L$(I)=""THEN RETURN
660 PRINTRIGHT$("0000"+MID$(STR$(I),2),4);TAB(6);L$(I)
670 NEXTI:RETURN
680 FOR I=SL TO EL
690 IF L$(I)=""THEN 730
700 L$(I)=""
710 QQ=QQ-1
720 NEXTI
730 IF EL=500 THEN RETURN
740 FOR I=1 TO 500-EL
750 IF L$(I+EL)=""THEN RETURN
760 L$(I+SL-1)=L$(I+EL)
770 L$(I+EL)=""
780 NEXTI
790 RETURN
800 FOR I=SL TO EL
810 IF L$(I)=""THEN RETURN
820 PRINT RIGHT$("0000"+MID$(STR$(I),2),4);TAB(6);L$(I
)
830 LINE INPUT"ALTER ?";A$
840 IF A$=""THEN 860
850 L$(I)=A$
860 NEXTI:RETURN
```

source program
RUN (Enter)
and to each 000N] prompt reply with your code with syntax as above. There are several assembler directives:

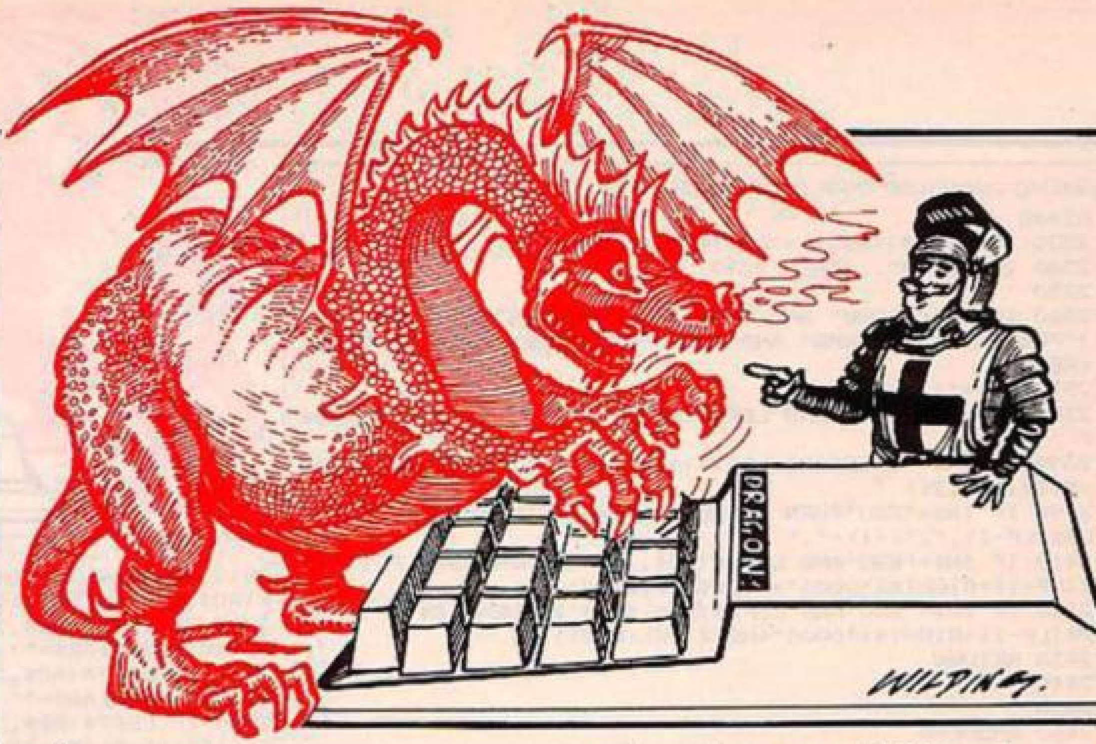
ORG [] Location (when used as the first creative code line it will locate the m/code will be assembled to locations)
Lable [] Equ [] Value (will assign the value "Value" to the lable "Lable" n.b only locations work)

EXEC [] Location (will define the user entry post for the m/code routine if not the first instruction)

* All characters following are ignored
Editor directives: *ASSM* will assemble the source code to 29000 unless otherwise specified.

SAVE will save your source file to tape.
SAVEM will save your assembled code to tape. Keep two separate tapes labelled "Source" "Code" or something similar.
LOAD will load a source file into memory. If merge is used two files will be merged.
TEST will execute the file i.e., EXEC 29000 or as specified by Exec [] Location.
EDIT allows you to change, delete, replace etc. all or parts of the source code — see below.

Editor directives: L: — Lists whole program; L1 — lists line 1; L1, 10 — list lines 1 to 10 inclusive; L10, — lists lines 10 to end of program; L, 10 — Lists to line 10.
The first character indicates editor mode and the other character are Data.
Other directives: D Delete line/lines; L List line/lines; A Alter line/lines; I Insert lines before — terminated by "end": R Replace line/lines — the strings are inputted separately; E End Edit and return to normal mode.



EXAMPLES (1)
0001] [] LDX [] #$400
0002] Loop [] COM [], X+
0003] [] CMPX [] #$600
0004] [] BLO [] LOOP
0005] [] RTS
0006] ASSM

When assembly is completed type "TEST" (Enter) and observe the results. This is equivalent to the Basic program.

1 X = &H400
2 POKEX, (256 – PEEK(X)):X = X + 1
3 IF X < $H600 THEN 2
4 END

Now if we want to change the program to fill the screen with spaces. Instead of rewriting the whole routine we can edit it. Type "EDIT" and you will be prompted with "Command —"
Then we want to Insert line 2 "LDA #0". Alter line 3 "LOOP STA,X+" so type 12 Enter
And then " [] LDA [] #0"

to leave Insert type "END" and you are prompted with "Command" now list the program by typing L Enter. You should now see:

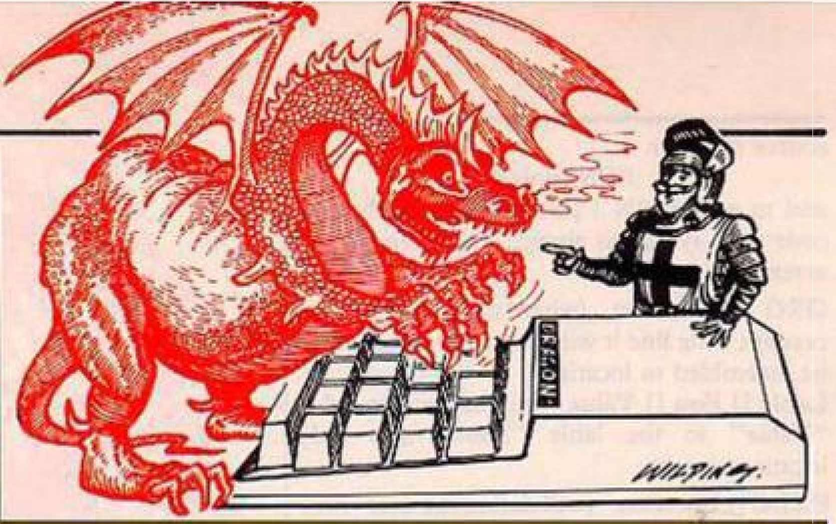
0001] LDX #$400
0002] LDA #0
0003] LOOP COM ,X+
0004] CMPX #$600
0005] BLO LOOP
0006] RTS

Command: We want to "A"lter line 3 so type "A3" you will see "ALTER]" and the line you desired. (If you press Enter without typing in any data the line will be unchanged). Type in "LOOP [] STA [], X+" Enter. You should now have "COMMAND"–Try listing it L and then Type E to return to Editor. You should see "0007]".
Which is asking you for the next line and type "ASSM" Enter. Then test it as before described.

You can write your own editor which will work as long as the syntax is the same and is stored in LS.

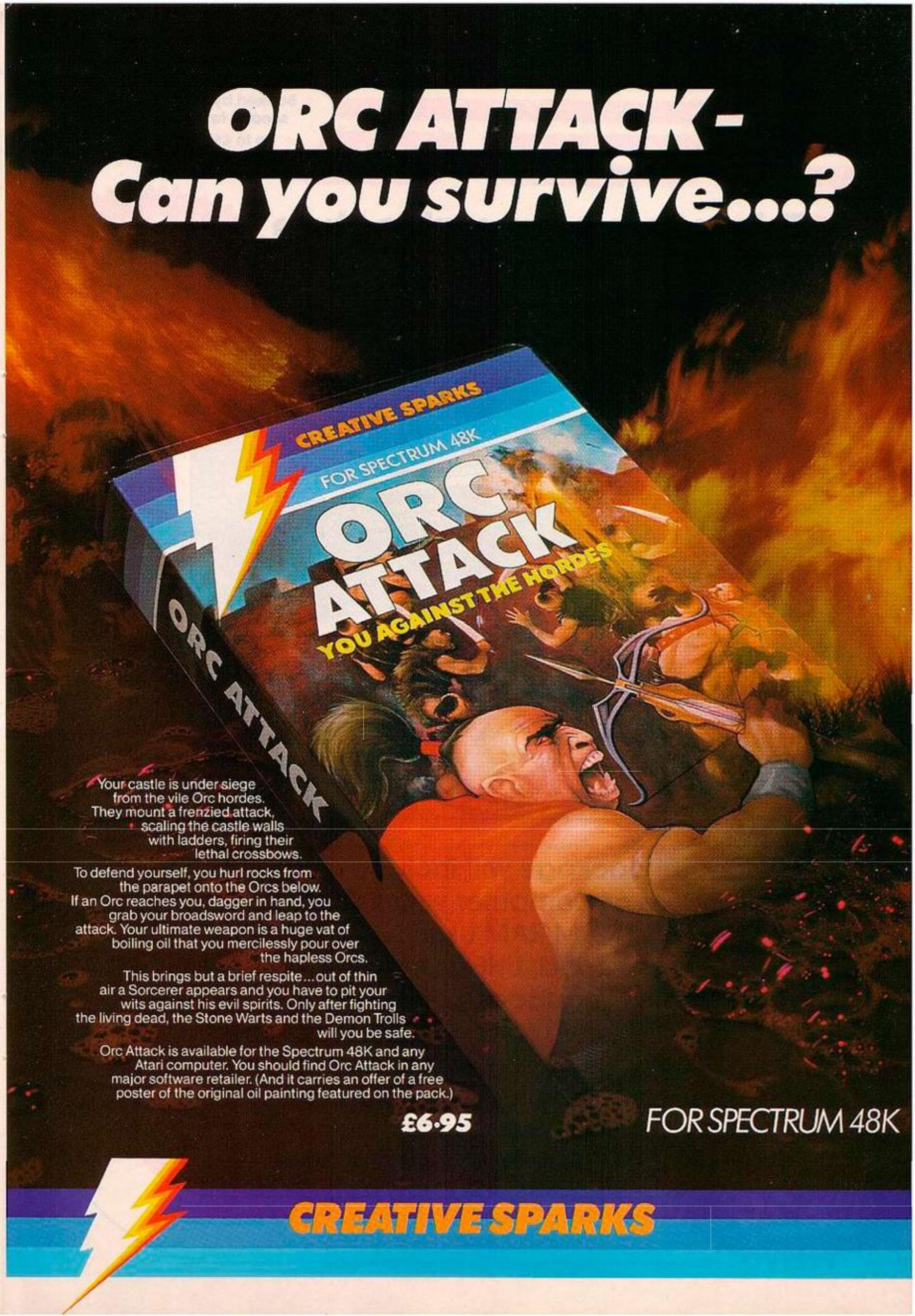
```
970 LINE INPUT" SEARCH STRING ?";SS$
880 LINE INPUT" REPLACE WITH  ?";RR$
890 FOR I=SL TO EL
900 IF L$(I)=""THEN RETURN
910 PP=INSTR(L$(I),SS$)
920 IF PP=0 THEN 970
930 FF$=LEFT$(L$(I),PP-1)
940 AA$=MID$(L$(I),PP+LEN(SS$))
950 L$(I)=FF$+RR$+AA$
960 PRINTRIGHT$("0000"+MID$(STR$(I),2),4);TAB(6);L$(I)
970 NEXTI:RETURN
980 SL=VAL(MID$(CM$,2))
990 PRINTRIGHT$("0000"+MID$(STR$(SL),2),4);"  ";:LINE
INPUT"]";AA$
1000 IF AA$="END"THEN RETURN
1010 QQ=QQ+1
1020 FOR I=1 TO 500
1030 IF L$(I)=""THEN EL=I:GOTO1050
1040 NEXTI:PRINT"NO SPACE ?":RETURN
1050 FOR I=EL TO SL+1 STEP -1
1060 L$(I)=L$(I-1)
1070 NEXTI
1080 L$(SL)=AA$:SL=SL+1:GOTO990
1090 REM *** START ASSEMBLY ***
1100 IP=1:LP=1:AP=1
1110 ST=29000
1120 LO=29000
1130 BL=29000
1140 BA=29000
1150 IF LEFT$(L$(IP),4)<>" ORG"THEN 1210
1160 IF MID$(L$(IP),6,1)="$"THEN LO=VAL("&H"+MID$(L$(I
P),7)):ELSE LO=VAL(MID$(L$(IP),6))
1170 BA=LO
1180 BL=BA
1190 ST=LO
1200 IP=IP+1
1210
1220 PRINT"*********ASSEMBLING**************";
1230 KK$=L$(IP)
1240 IF KK$=""THEN 1480
1250 IF LEFT$(KK$,1)="*"THEN IP=IP+1:GOTO1230
1260 IF LEFT$(KK$,1)=" "THEN 1330
1270 SP=INSTR(KK$," ")
1280 IF SP=0 THEN PRINT"SYNTAX IN LINE ";IP:RETURN
1290 LL$=LEFT$(KK$,SP-1)
1300 PP$=RIGHT$("0000"+HEX$(LO),4)
1310 LB$(LP)=LL$+","+PP$:LP=LP+1
1320 KK$=MID$(KK$,SP)
1330 IF KK$=""THEN 1480
1340 AS$=MID$(KK$,2):GOSUB 1950
1350 IF HD$=".."THEN HD$=""
1360 IF ER$=""THEN 1370 ELSE PRINT:PRINTER$;" IN LINE
";IP:RETURN
1370 PRINTHEX$(LO);:IF HD$<>""THEN AC$(AP)=HEX$(LO)+"
"+HD$:AP=AP+1
1380 IF LEFT$(L$(IP),1)<>" "THEN PRINTTAB(6);LEFT$(L$(
IP),INSTR(L$(IP)," ")-1);
1390 PRINTTAB(16);IN$;TAB(22);AD$
1400 IF INSTR(HD$,"[")=0 AND INSTR(HD$,"@")=0 THEN LO=
LO+LEN(HD$)/2:IP=IP+1:GOTO1230
1410 IF RIGHT$(HD$,1)="]"THEN 1450
1420 PP=INSTR(HD$,"@")
1430 PP=(PP-1)/2
1440 PP=PP+1:LO=LO+PP:IP=IP+1:GOTO1230
1450 PP=INSTR(HD$,"[")
1460 PP=(PP-1)/2
1470 PP=PP+2:LO=LO+PP:IP=IP+1:GOTO1230
1480
1490 FOR I=1 TO AP
1500 IF INSTR(AC$(I),"@")=0 THEN1710
1510 PP=INSTR(AC$(I),"@")
1520 DD$=MID$(AC$(I),PP+1,LEN(AC$(I))-PP-1)
1530 FOR J=1 TO LP
1540 IF LB$(J)=""THEN 1580
1550 PD=INSTR(LB$(J),",")
1560 IF LEFT$(LB$(J),PD-1)=DD$THEN 1590
1570 NEXTJ
1580 PRINT"3NO LABLE-";DD$:RETURN
1590 TT=VAL("&H"+MID$(LB$(J),PD+1))
1600 FF=VAL("&H"+LEFT$(AC$(I),4))
1610 DD=TT-FF
1620 IF MID$(AC$(I),6,2)="10"THEN DD=DD-3:LK=4 ELSE DD
=DD-2:LK=2
1630 IF MID$(AC$(I),6,2)="17"OR MID$(AC$(I),6,2)="16"T
HEN DD=TT-FF-3:LK=4
1640 IF LK=4 AND DD<0 THEN DD=DD+65536
1650 IFLK=2AND DD<0 THEN DD=DD+256
1660 IFLK=2 THEN DD$=RIGHT$("00"+HEX$(DD),2)
1670 IFLK=4 THEN DD$=RIGHT$("0000"+HEX$(DD),4)
1680 PD=INSTR(AC$(I),"@")
1690 AC$(I)=LEFT$(AC$(I),PD-1)+DD$
1700 GOTO1820
1710 IF INSTR(AC$(I),"[")=0 THEN1820
1720 BP=INSTR(AC$(I),"[")
1730 DD$=MID$(AC$(I),BP+1,LEN(AC$(I))-BP-1)
1740 FOR J=1 TO LP
1745 IF LB$(J)=""THEN 1780
1750 JJ=INSTR(LB$(J),",")
1760 IF LEFT$(LB$(J),JJ-1)=DD$THEN 1790
1770 NEXTJ
1780 PRINT"3NO LABLE-";DD$:RETURN
1790 DD$=MID$(LB$(J),JJ+1)
1800 JJ=INSTR(AC$(I),"[")
1810 AC$(I)=LEFT$(AC$(I),JJ-1)+DD$
1820 NEXTI
1830 PRINT"********** FINISHED ************";
1840 FOR I=1 TO 500
1850 IF AC$(I)=""THEN RETURN
1860 GG$=AC$(I)
1870 PRINTGG$
1880 PP=INSTR(GG$," ")
1890 GG$=MID$(GG$,PP+1)
1900 FOR H=1 TO LEN(GG$)/2
1910 IF BL<29000 OR BL>32766 THEN PRINT"3NO MEMORY":RE
TURN
1920 POKE BL,VAL("&H"+MID$(GG$,2*H-1,2)):BL=BL+1
1930 NEXTH,I
1940 RETURN
1950 TP$="......":F$="":HD$="..":LN=0:ER$="":SY$=""
1960 SP=INSTR(AS$," ")
1970 IF SP=0 THEN IN$=AS$:PK$=IN$:AD$=""ELSE IN$=LEFT$
(AS$,SP-1):PK$=IN$:AD$=MID$(AS$,SP+1)
1980 IF LEN(IN$)<5THEN IN$=IN$+" ":GOTO1980
1990 ZZ$(0)="ABX  ....3..A..1ADCA 89AB...9..1ADCB CDEF
...9..1ADDA 89AB...B..1ADDB CDEF...B..1ADDD CDEF...3..
2ANDA 89AB...4..1ANDB CDEF...4..1ANDCC1......C..1ASLA
....4..8..1ASLB ....5..8..1ASL  .067...8..2ASRA ....4.
.7..1ASRB ....5..7..1ASR  .067...
2000 ZZ$(1)="BITA 89AB...5..2BITB CDEF...5..2CLRA ....
4..F..1CLRB ....5..F..1CLR  .067...F..2CMPA 89AB...1..
1CMPB CDEF...1..1CMPD 89AB...3102CMPS 89AB...C112CMPU
89AB...3112CMPX 89AB...C..2CMPY 89AB...C102COMA ....4.
.3..1COMB ....5..3..1COM  .067...3..2"
2010 ZZ$(2)="CWAI 3......C..1DAA  ....1..9..1DECA ....
4..A..1DECB ....5..A..1DEC  .06F...A..2EORA 89AB...8..
1EORB CDEF...8..1EXG  ....1..E..1INCA ....4..C..1INCB
....5..C..1INC  .067...C..2JMP  .067...E..2JSR  .9AB..
.D..2LDA  89AB...4..1LDB  CDEF...6..1"
2020 ZZ$(3)="LDD  CDEF...C..2LDS  CDEF...E102LDU  CDEF
...E..2LDX  89AB...E..2LDY  89AB...E102LEAS ..3....2..
2LEAU ..3....3..2LEAX ..3....0..2LEAY ..3....1..2LSLA
....4..8..1LSLB ....5..8..1LSL  .067...8..2LSRA ....4.
.4..1LSRB ....5..4..1LSR  .067...4..2"
2030 ZZ$(4)="MUL  ....3..D..1NEGA ....4..0..1NEGB ....
5..0..1NEG  .067...0..2NOP  ....1..2..1ORA  89AB...A..
1ORB  CDEF...A..1ORCC 1......A..1PSHS 3......4..1PSHU
3......6..1PULS 3......5..1PULU 3......7..1ROLA ....4.
.9..1ROLB ....5..9..1ROL  .067...9..2"
2040 ZZ$(5)="RORA ....4..6..1RORB ....5..6..1ROR  .067
...6..2RTI  ....3..B..1RTS  ....3..9..1SBCA 89AB...2..
1SBCB CDEF...2..1SEX  ....1..D..1STA  .9AB...7..2STB
.DEF...7..2STD  .DEF...D..2STS  .DEF...F102STU  .DEF..
.F..2STX  .9AB...F..2STY  .9AB...F102"
2050 ZZ$(6)="SUBA 89AB...0..1SUBB CDEF...0..1SUBD 89AB
...3..2SWI1 ....3..F..1SWI2 ....3..F101SWI3 ....3..F11
1SYNC ....1..3..1TFR  ....1..F..1TSTA ....4..D..1TSTB
....5..D..1TST  .067...D..2"
2060 FOR HH=0 TO 6
2070 PK=INSTR(ZZ$(HH),IN$)
2080 IF PK<>0 THEN 2120
2090 NEXT HH
2100 IN$=PK$
2110 GOTO 2180
2120 PK$=MID$(ZZ$(HH),PK+5,11)
2130 TP$=LEFT$(PK$,6):PK$=MID$(PK$,7)
2140 HD$=LEFT$(PK$,2):PK$=MID$(PK$,3)
2150 F$=LEFT$(PK$,2):PK$=MID$(PK$,3)
2160 IF F$=".."THEN F$=""
2170 LN=VAL(PK$)
2180 IF IN$="BHS"THEN IN$="BCC"
2190 IF IN$="LBHS"THEN IN$="LBCC"
2200 IF IN$="BLO"THEN IN$="BCS"
2210 IF IN$="LBLO"THEN IN$="LBCS"
2220 IF HD$<>".."THEN 2440
2230 IF LEFT$(IN$,1)="B"OR LEFT$(IN$,2)="LB"THEN 2240
ELSE 2350
2240 TP$=".....2"
2350 OP$="CCCSEQGEGTHILELSLTMINEPLRARNVCVS"
2260 RR$=".4.5.7.C.E.2.F.3.D.B.6.A.0.1,8.9"
2270 FOR II=1 TO 16
2280 IF RIGHT$(IN$,2)=MID$(OP$,II*2-1,2) THEN HD$=MID$
(RR$,II*2-1,2):GOTO2300
2290 NEXTII
2300 IF IN$="BSR"THEN TP$=".....8":HD$=".D":GOTO2440
2310 IF IN$="LBSR"THEN TP$=".....1":HD$=".7":GOTO2440
2320 IF IN$="LBRA"THEN TP$=".....1":HD$=".6":F$="":GOT
```

(listing continued next page)



(listing continued from previous page)

```
02440
2330 IF LEFT$(IN$,2)="LB"THEN F$="10"
2340 IF HD$<>".."THEN 2440
2350 '
2360 IF IN$<>"ORG" AND IN$<>"EQU"ANDIN$<>"FCC"AND IN$<
>"FCB"AND IN$<>"RMB" AND IN$<>"EXEC"THEN ER$="]OPCODE"
:RETURN
2370 ER$=""
2380 IF IN$="EXEC"AND LEFT$(AD$,1)<>"$"THEN ST=VAL(AD$
)
2390 IF IN$="EXEC"AND LEFT$(AD$,1)="$"THEN ST=VAL("&H"
+MID$(AD$,2))
2400 IF IN$="EQU"THEN LB$(LP-1)=LEFT$(LB$(LP-1),INSTR(
LB$(LP-1),",")-1)+","
2410 IF IN$="EQU"AND LEFT$(AD$,1)="$"THEN LB$(LP-1)=LB
$(LP-1)+RIGHT$("0000"+MID$(AD$,2),4)
2420 IF IN$="EQU"AND LEFT$(AD$,1)<>"$"THEN LB$(LP-1)=L
B$(LP-1)+RIGHT$("0000"+HEX$(VAL(AD$)),4)
2430 RETURN
2440 '
2450 '
2460 AMODE=0
2470 IF LEFT$(IN$,3)="PSH"OR LEFT$(IN$,3)="PUL"THEN AM
=1
2480 IF LEFT$(AD$,1)="#"AND INSTR(AD$,",")=0THEN AM=1'
IMMEDIATE
2490 IF INSTR(AD$,"(DP)")<>0 THEN AM=2'DIRECT PAGE
2500 IF AM=0 AND (LEFT$(AD$,1)="$" OR INSTR(AD$.".")=0
) THEN AM=4
2510 IF AD$=""OR IN$="TFR"OR IN$="EXG" THEN AM=5
2520 IF MID$(TP$,6,1)<>"."THEN AM=6
2530 IF AM=0 THEN AM=3
2540 IF MID$(TP$,AM,1)="."THEN ER$="]ADDRESS TYPE-":RE
TURN
2550 HE$=F$+MID$(TP$,AM,1)+RIGHT$(HD$,1)
2560 HD$=HE$
2570 IF AM<>1THEN 2650
2580 IF LEFT$(IN$,3)="PSH"OR LEFT$(IN$,3)="PUL"THEN 33
40
2590 IF MID$(AD$,2,1)="$"THEN DD$=MID$(AD$,3)
2600 IF MID$(AD$,2,1)<>"$"AND ASC(MID$(AD$,2,1))>58 TH
EN HD$=HD$+"["+MID$(AD$,2)+"]":RETURN
2610 IF MID$(AD$,2,1)<>"$"THEN DD$=HEX$(VAL(MID$(AD$,2
)))
2620 IF LEN(DD$)<>LN*2 THEN DD$="0"+DD$: IF LEN(DD$)>4
THEN ER$="]ADDRESS ":RETURN ELSE GOTO2620
2630 HD$=HD$+DD$
2640 RETURN
2650 IF AM<>2THEN 2690
2660 RR$=MID$(AD$,6)
2670 IF LEFT$(RR$,1)="$"THEN HD$=HD$+MID$(RR$,2):RETUR
N
2680 HD$=HD$+RIGHT$("000"+HEX$(VAL(RR$)),2):RETURN
2690 IF AM<>4 THEN 2730
2700 IF MID$(AD$,2,1)="#"THEN DD$=RIGHT$("00000"+HEX$(
VAL(MID$(AD$,3))),4):HD$=HD$+DD$:RETURN
2710 IF MID$(AD$,1,1)<>"$" THEN HD$=HD$+"["+AD$+"]":RE
TURN
2720 HD$=HD$+RIGHT$("0000"+MID$(AD$,2),4):RETURN
2730 IF AM<>5 THEN 2760
2740 IF IN$<>"EXG"AND IN$<>"TFR"THEN RETURN
2750 GOTO 3200
2760 IF AM=6 THEN HD$=HD$+"@"+AD$+"@":RETURN
2770 REM INDEXED
2780 DD$="00000000":AB$=""
2790 IF LEFT$(AD$,1)="["THEN AD$=MID$(AD$,2,LEN(AD$)-2
):CN=1ELSE CN=0
2800 IF LEFT$(AD$,1)=","AND MID$(AD$,2,1)<>"-"AND RIGH
T$(AD$,1)<>"+"THEN AB=0:AB$="": DD$="1"+RIGHT$(AD$,1)+
"000100":GOTO3040
2810 IF LEFT$(AD$,2)="A,"THEN DD$="1"+RIGHT$(AD$,1)+"0
00110":AB=0:AB$="":GOTO3040
2820 IF LEFT$(AD$,2)="B,"THEN DD$="1"+RIGHT$(AD$,1)+"0
00101":AB$="":AB=0:GOTO3040
2830 IF LEFT$(AD$,2)="D,"THEN DD$="1"+RIGHT$(AD$,1)+"0
01011":AB=0:AB$="":GOTO3040
2840 IF INSTR(AD$,",")>1 AND RIGHT$(AD$,1)<>"+"AND LEF
T$(AD$,1)<>"A"AND LEFT$(AD$,1)<>"B"AND LEFT$(AD$,1)<>"
D"AND INSTR(AD$,"PCR")=0 AND MID$(AD$,2)<>"-"THEN 2850
ELSE 2920
2850 IF LEFT$(AD$,1)<>"#"THEN DD$="1"+RIGHT$(AD$,1)+"0
01001":AB$="["+LEFT$(AD$,INSTR(AD$,",")-1)+"]":AB=0:GO
TO3040
2860 IF MID$(AD$,2,1)="$"THEN NN=VAL("&H"+MID$(AD$,3,I
NSTR(AD$,",")-3))
2870 IF MID$(AD$,2,1)<>"$"THEN NN=VAL(MID$(AD$,2,INSTR
(AD$,",")-2))
2880 IF NN>=-16 AND NN<=15 THEN  AB=NN-32*(NN<0):AB$="
":DD$="0"+RIGHT$(AD$,1)+"000000":GOTO3040
2890 IF NN>=-128 AND NN<=127THEN NN=NN-(NN<0)*256:AB$=
RIGHT$("00"+HEX$(NN),2):AB=0:DD$="1"+RIGHT$(AD$,1)+"00
1000":GOTO3040
2900 IF NN<0 THEN NN=NN+&HFFF
2910 AB$=RIGHT$("00000"+HEX$(NN),4):AB=0:DD$="1"+RIGHT
$(AD$,1)+"001001":GOTO3040
2920 IF LEFT$(AD$,2)="A,"THEN DD$="1"+RIGHT$(AD$,1)+"0
00110":AB=0:AB$="":GOTO3040
2930 IF LEFT$(AD$,2)="B,"THEN DD$="1"+RIGHT$(AD$,1)+"0
00101":AB=0:AB$=""
2940 IF LEFT$(AD$,2)="D,"THEN DD$="1"+RIGHT$(AD$,1)+"0
01011":AB=0:AB$="":GOTO3040
2950 IF RIGHT$(AD$,2)="++"THEN DD$="1"+MID$(AD$,2,1)+"
000001":AB=0:AB$="":GOTO3040
2960 IFRIGHT$(AD$,1)="+"THENDD$="1"+MID$(AD$,2,1)+"000
000":AB=0:AB$="":GOTO3040
2970 IF MID$(A$,2,2)="--"THEN DD$="1"+RIGHT$(AD$,1)+"0
00011":AB=0:AB$="":GOTO3040
2980 IFINSTR(AD$,"PCR")=0 AND MID$(AD$,2,1)="-"THEN DD
$="1"+RIGHT$(AD$,1)+"000010":AB=0:AB$="":GOTO3040
2990 IF LEFT$(AD$,1)<>"#"THEN AB$="@"+MID$(AD$,1,INSTR
(AD$,",")-1)+"@":AB=0:DD$="10001101":F$="":GOTO3040
3000 NN=VAL(MID$(AD$,2,INSTR(AD$,",")-2))
3010 IF NN>=-128ANDNN<=127 THEN DD$="10001100":AB$=RIG
HT$("00"+HEX$(NN-256*(NN<0)),2):AB=0:GOTO3040
3020 IF NN<0 THEN NN=NN+&HFFFF:AB$=RIGHT$("0000"+HEX$(
NN),4):DD$="10001101":AB=0:GOTO3040
3030 AB$=RIGHT$("0000"+HEX$(NN),4):DD$="10001101":AB=0
:GOTO3040
3040 BY=0
3050 IF LEFT$(DD$,1)="1"THEN BY=BY+128
3060 IF MID$(DD$,2,1)="1"THEN BY=BY+64
3070 IF MID$(DD$,3,1)="1"THEN BY=BY+32
3080 IF MID$(DD$,4,1)="1"THEN BY=BY+16
3090 IF MID$(DD$,5,1)="1"THEN BY=BY+8
3100 IF MID$(DD$,6,1)="1"THEN BY=BY+4
3110 IF MID$(DD$,7,1)="1"THEN BY=BY+2
3120 IF MID$(DD$,8)="1"THEN BY=BY+1
3130 BY=BY+AB
3140 IF MID$(DD$,2,1)="Y"THEN BY=BY+32
3150 IF MID$(DD$,2,1)="U"THEN BY=BY+64
3160 IF MID$(DD$,2,1)="S" THEN BY=BY+64+32
3170 IF CN=1 THEN BY=BY+16
3180 HD$=HD$+RIGHT$("000"+HEX$(BY),2)+AB$
3190 RETURN
3200 'EXG /TFR
3210 CP=INSTR(AD$,",")
3220 FF$=LEFT$(AD$,CP-1)
3230 TT$=MID$(AD$,CP+1)
3240 PB=0
3250 FOR L=0 TO 1
3260 IF L=0 THEN G$=FF$ELSE G$=TT$
3270 IF G$="D"THEN PB=0
3280 IF G$="X"THENPB=1ELSEIFG$="Y"THEN PB=2ELSEIFG$="U
"THENPB=3ELSEIFG$="S"THENPB=4ELSEIFG$="PC"THENPB=5ELSE
IFG$="B"THENPB=9ELSEIFG$="CC"THENPB=10ELSEIFG$="DP"THE
NPB=11
3290 IF G$="A"THEN PB=8
3300 IF L=0 THEN FF=16*PB:PB=0
3310 IF L=1 THEN FF=FF+PB
3320 NEXTL
3330 HD$=HD$+RIGHT$("000"+HEX$(FF),2):RETURN
3340 REM PUSH PULL
3350 IF LEFT$(AD$,1)="$"THEN HD$=HD$+RIGHT$(AD$,2):RET
URN
3360 IF INSTR(AD$,",")=0 AND ASC(LEFT$(AD$,1))<58 THEN
 HD$=HD$+RIGHT$("0000"+HEX$(VAL(AD$)),2):RETURN
3370 PB=0
3380 CP=INSTR(AD$,",")
3390 IF CP=0 THEN CC$=AD$:LA=1ELSE CC$=LEFT$(AD$,CP-1)
:LA=0:AD$=MID$(AD$,CP+1)
3400 IF CC$="PC"THEN PB=PB+128
3410 IF CC$="S" THEN PB=PB+64
3420 IF CC$="Y" THEN PB=PB+32
3430 IF CC$="X" THEN PB=PB+16
3440 IF CC$="DP"THEN PB=PB+8
3450 IF CC$="B" THEN PB=PB+4
3460 IF CC$="A" THEN PB=PB+2
3470 IF CC$="CC"THEN PB=PB+1
3480 IF LA=0 THEN 3380
3490 HD$=HD$+RIGHT$("000"+HEX$(PB),2)
3500 RETURN
```


ORC ATTACK-
Can you survive...?
CREATIVE SPARKS
FOR SPECTRUM 48K
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ORC ATTACK
Your castle is under siege from the vile Orc hordes. They mount a frenzied attack, scaling the castle walls with ladders, firing their lethal crossbows.
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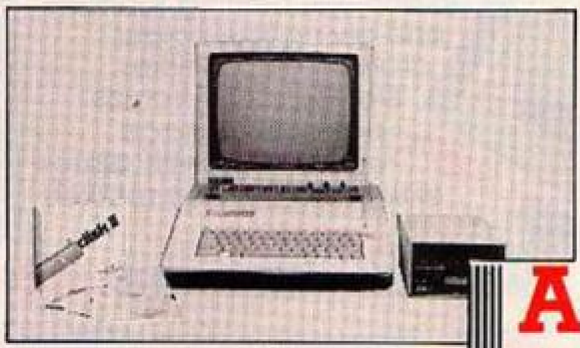


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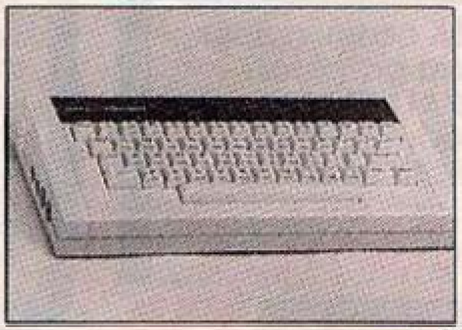
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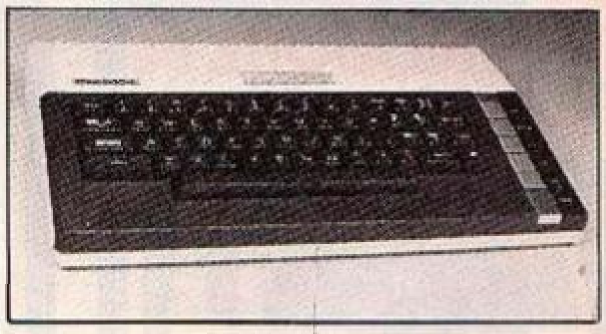
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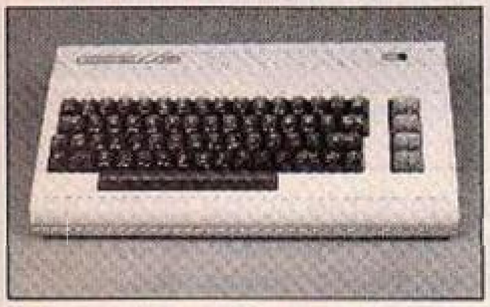
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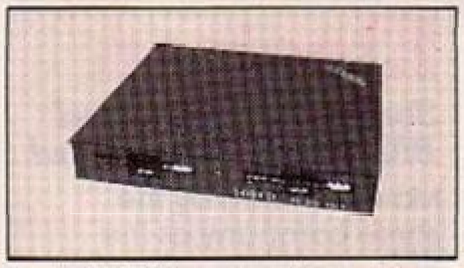
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THIS PROGRAM is a mixture of machine code and Basic and runs on the 16K and 48K ZX Spectrums.

The object of the game is to move your Zebbedy up a series of continuously shifting platforms. This is done by jumping through the holes which appear. To avoid falling through them and suffering an agonising death, you can move him either left or right.

At the beginning of the game you will have only to jump the platforms. When you reach the top platform you should proceed to strike a bell on the top left-hand corner of the screen with the provided hammer. This will gain you bonus points and entry into the next round of the game where you will encounter a UFO — which, like all the obstacles in the game, you must avoid — flying across any one of the platforms. To enter the next round you sound the bell again.

In this round you avoid, not another UFO, but a swooping robot which can lose you some lives if you are not careful.

If you get to enter the last round you'll be up against a two-gunned extra-terrestrial, bobbing up and down in the centre of the screen, firing plasma beams in either or both directions between the platforms.

These rounds are repeated, if you're lucky to survive through the first.

Key 1 to move Zebbedy left
Key 2 to move Zebbedy right
Key 0 to jump

Initially, you are assigned five Zebbedies to amass a high score. For every successful or attempted jump you are awarded 50 points. An extra 500 points are gained as bonus every time you succeed in striking the bell.

A Zebbedy is lost every time you fail to avoid the holes in the platforms or the obstacles. The game will end when all your men have been used up.

The program comes in three parts: Basic, user-defined characters and machine code.

The order of programming is as follows:

1. Type in the machine code loader in

Figure 2.

```
10 REM Machine Code Loader
20 LET a=32000
30 INPUT b
40 PRINT a,b: POKE a,b
50 LET a=a+1
60 IF a<32160 THEN GO TO 30
```

He wishes he were back on the *Magic Roundabout* now that he's met Vincent and Peter Li's Spectrum UFOs.

ZEBE

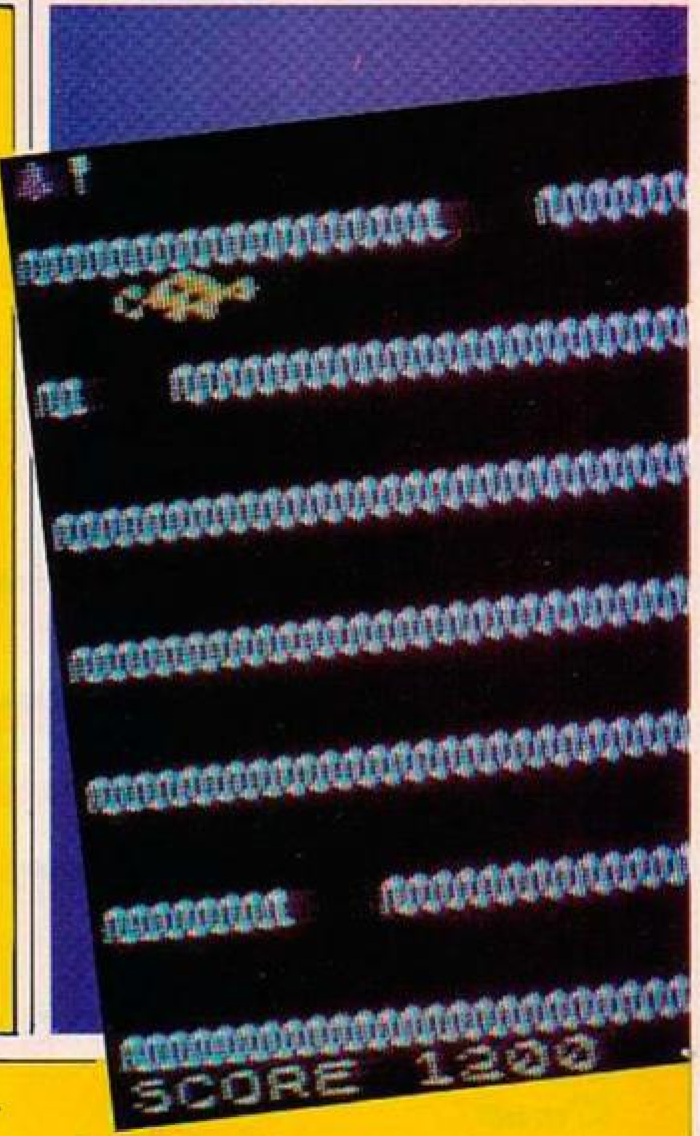


Figure 3.

```
32000: 6 8 213 213 225 35 197 1
32008: 31 0 26 237 176 43 119 35
32016: 35 19 193 225 17 0 1 25
32024: 229 209 16 230 201 0 0 0
32032: 6 8 213 213 225 43 197 1
32040: 31 0 26 237 184 35 119 43
32048: 43 27 193 225 17 0 1 25
32056: 229 209 16 230 201 0 243 17
32064: 64 64 205 0 125 17 191 64
32072: 205 32 125 17 0 72 205 0
32080: 125 17 127 72 205 32 125 17
32088: 192 72 205 0 125 17 63 80
32096: 205 32 125 0 205 154 125 197
32104: 6 8 203 30 23 16 251 119
32112: 35 193 16 243 205 154 125 203
32120: 56 203 56 203 56 72 17 7
32128: 0 25 17 16 0 6 8 126
32136: 245 43 16 251 25 13 32 245
32144: 205 154 125 241 119 35 16 251
32152: 251 201 6 24 33 128 127 201
```

Figure 1.

```
  10 REM        ZEBBEDY
  20 REM © VINCENT &
           PETER LI(LEE) 1983
  30 LOAD ""CODE : CLEAR 32000
LOAD ""CODE
  40 LET hi=0: GO SUB 610
  50 LET x=x-(INKEY$="1")+(INKEY
$="2")
  60 IF x<0 THEN LET x=30
  70 IF x>30 THEN LET x=0
  80 PRINT AT r,s;"  ";AT r+1,s;
"  "
  90 PRINT AT 0,0; INK 3;"O";AT
0,1; INK 4;"P"
 100 RANDOMIZE USR 32062
 105 REM enter letters between
     quotation marks in graphics
     mode
 110 PRINT AT 21,6; INK 4;sc
 120 IF y=0 AND x=1 THEN PRINT A
T y,1; BRIGHT 1; INK 4;"Q": BEEP
 .03,60: LET sc=sc+500: LET st=s
t+1: GO SUB 680: IF st=5 THEN GO
 SUB 675
 130 PRINT AT y,x; INK 4;"AB";AT
 y+1,x; INK 3;"CD"
 140 IF SCREEN$ (y+2,x)=" " THEN
 IF SCREEN$ (y+2,x+1)=" " THEN G
O SUB 530
 150 IF INKEY$="0" THEN IF SCREE
N$ (y-1,x)<>" " THEN IF SCREEN$
 (y-1,x+1)<>" " THEN GO SUB 500
 160 IF INKEY$="0" THEN PRINT AT
 y,x;"  ";AT y+1,x;"  ": LET y=y
-3: LET sc=sc+50
 170 LET r=y: LET s=x
 180 LET a=a-1: IF a=-1 THEN LET
 a=1
 190 IF st=2 THEN GO TO 230
 200 IF st=3 THEN GO TO 300
 210 IF st=4 THEN GO TO 420
 220 GO TO 50
 230 POKE 32155,24: POKE 32157,1
23: IF c<0 OR c>27 THEN LET d=-d
: LET q=INT (RND*5-RND*5)+3: LET
 e=e+q: IF e<0 OR e>18 THEN LET
e=e-q
 240 LET c=c+d
 250 PRINT AT e,c; INK 6;"FGH":
LET j=e: LET k=c: BEEP .0005,50
 260 IF ATTR (y,x-1)=6 THEN GO S
UB 530
 270 IF ATTR (y,x+2)=6 THEN GO S
UB 530
 280 PRINT AT j,k;"   "
 290 GO TO 50
 300 RANDOMIZE : LET t=INT (RND*
2)
 310 POKE 32155,24: POKE 32157,1
52
 320 IF c<0 OR c>27 THEN LET c=c
-d: LET d=-d
 330 IF t=0 THEN LET e=e+f
 340 IF t=1 OR t=0 THEN LET c=c+
d
 350 IF e<0 OR e>18 THEN LET e=e
-f: LET f=-f
 360 PRINT AT e,c; INK 4;" "+CHR
```

figure 2. Run and enter code from figure 3.

2. Using the UDG loader in figure 4, enter the code from figure 5.

3. Write in the main program in figure 1.

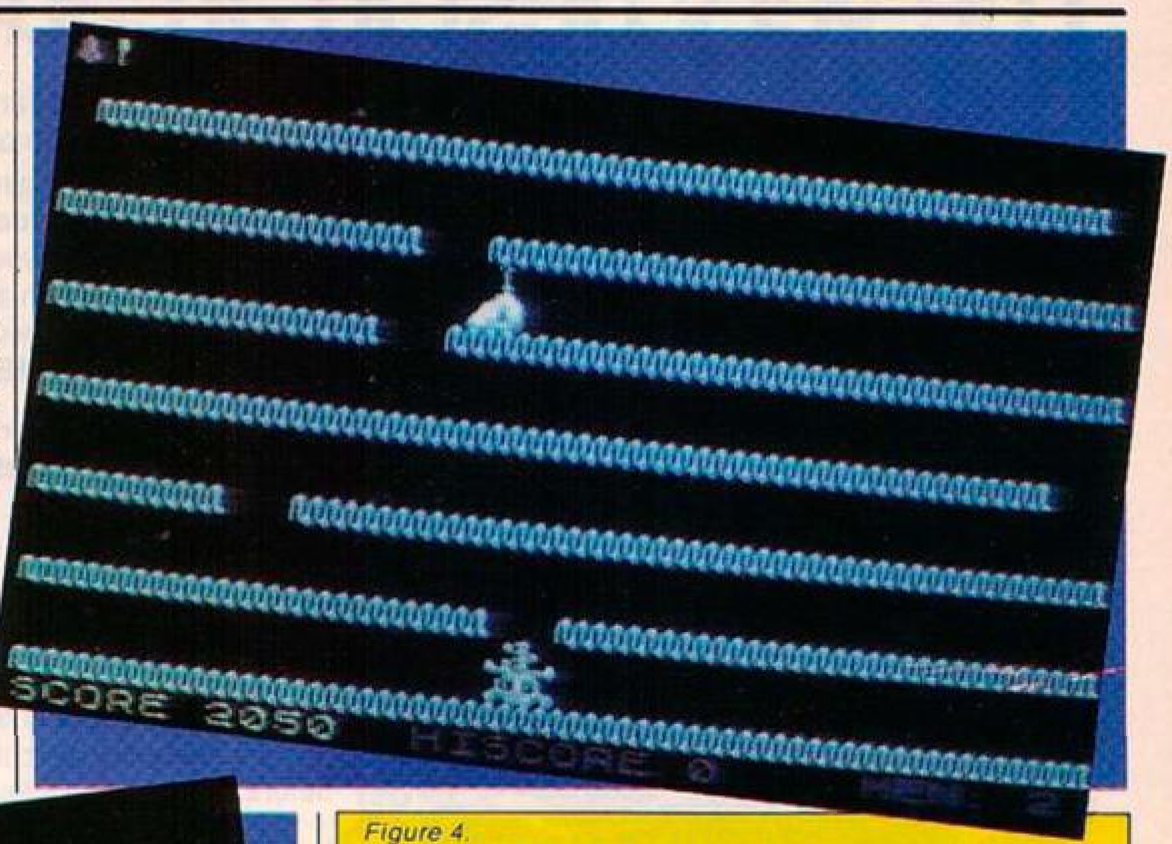
4. Finally, save the lot by entering:

```
SAVE "ZEBBEDY" LINE 10
SAVE "GRAPHICS" CODE USR "A", 168:
SAVE "ZEBCODE" CODE 32000 , 160
```

and verify them.

The machine code used in the game consists of two self-written routines. The first scrolls with wrap-around specific lines by one character either left or right and the second adds animation to selected user-defined graphics.

BEDY



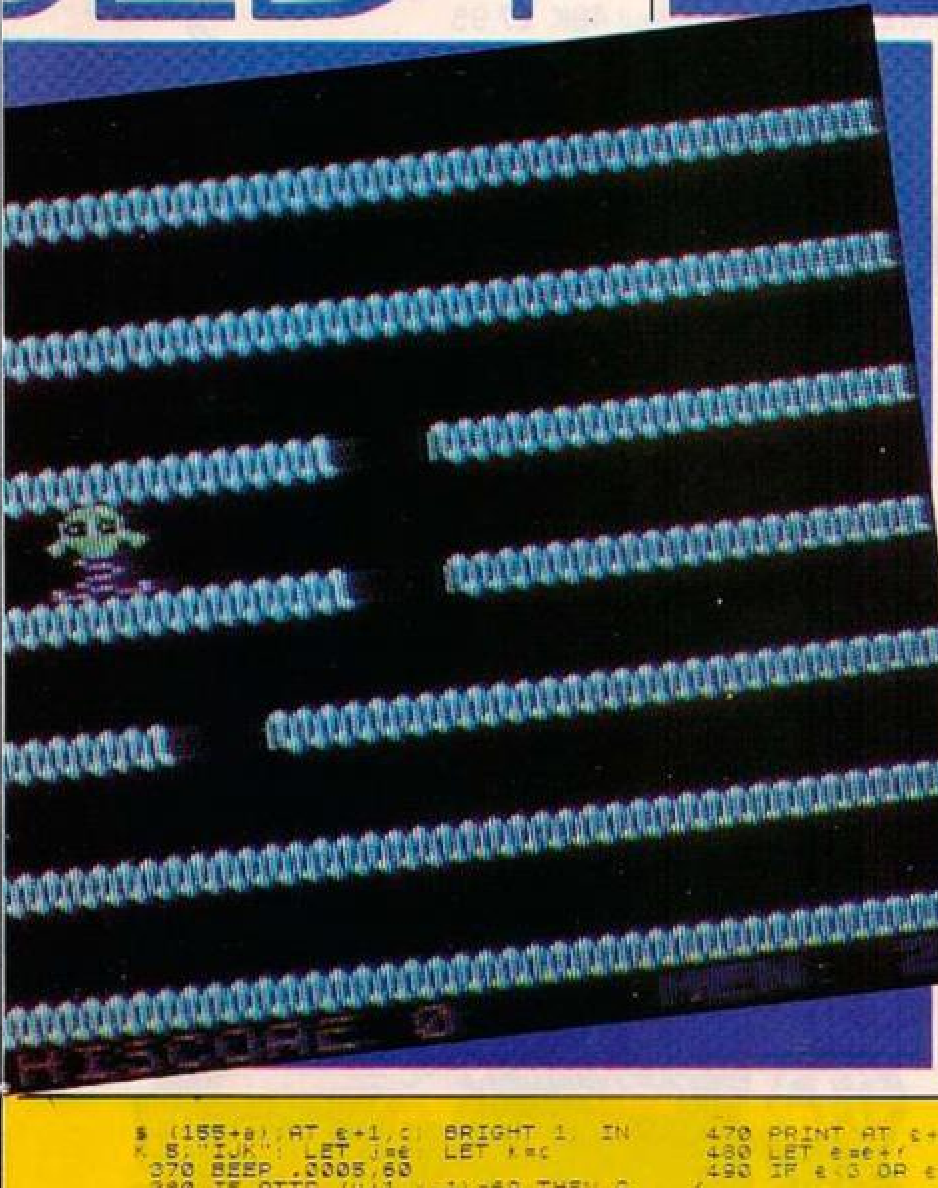


Figure 4.

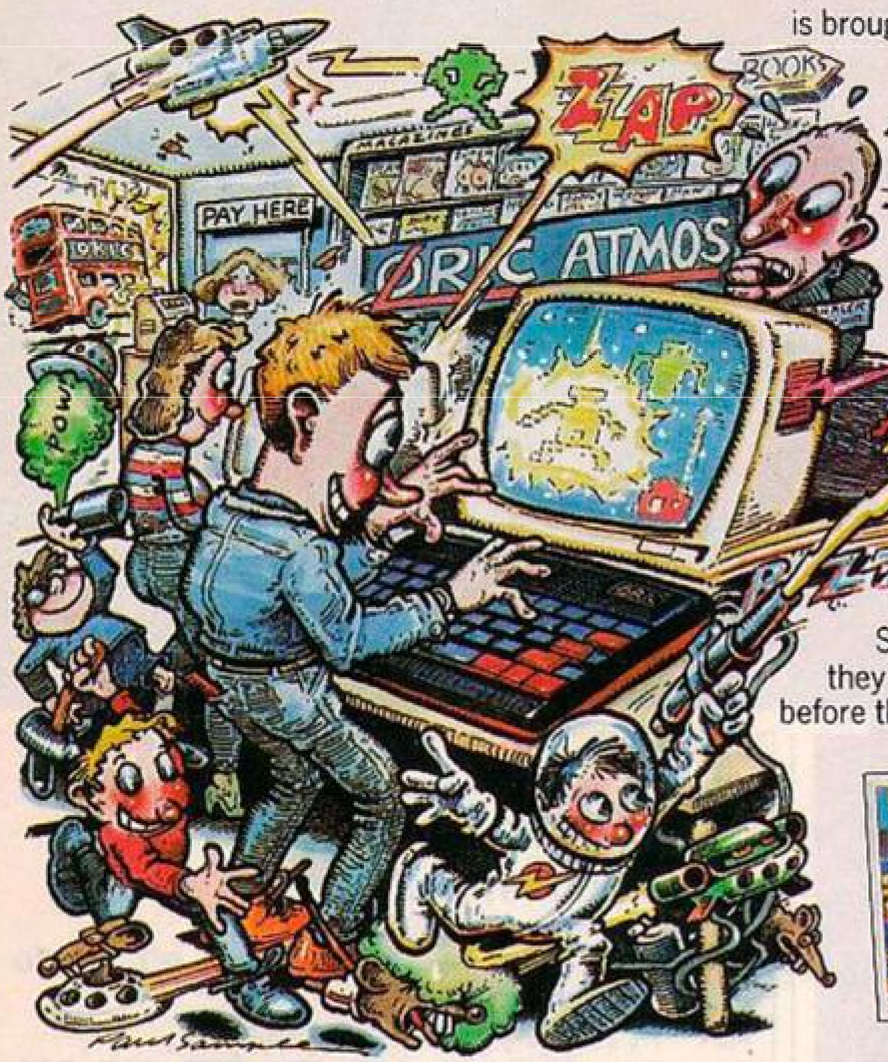
```
10 REM Graphics Loader
20 LET a=USR "a"
30 INPUT b
40 PRINT a,b: POKE a,b
50 LET a=a+1
60 IF a<(USR "a"+168) THEN GO TO 30
```

Figure 5. GRAPHIC

```
A:  7,15,17,21,17,63,239,71,
B:  224,240,136,168,136,252,247,226,
C:  3,12,3,0,3,12,195,252,
D:  192,0,192,48,192,0,195,63,
E:  60,126,219,126,24,24,189,63,
F:  0,0,113,139,143,139,112,0,
G:  60,255,159,159,243,243,126,231,
H:  0,0,128,206,241,206,0,0,
I:  0,0,1,1,3,7,15,15,
J:  60,126,255,255,164,231,0,252,
K:  0,0,128,224,252,254,15,240,
L:  127,85,127,85,127,28,8,60,
M:  20,8,8,8,8,28,8,60,
N:  0,238,170,170,170,170,187,0,
O:  0,24,60,60,60,126,126,24,
P:  0,28,28,28,8,8,8,8,
Q:  0,32,112,224,80,8,4,2,
R:  14,24,63,49,253,181,191,31,
S:  112,24,253,141,239,172,252,248,
T:  28,134,163,171,255,169,160,128,
U:  60,97,197,213,255,149,5,1,
```

```
$ (155+a);AT e+1,c; BRIGHT 1; IN
K 5;"IJK": LET j=e: LET k=c
 370 BEEP .0005,60
 380 IF ATTR (y+1,x-1)=69 THEN G
O SUB 530
 390 IF ATTR (y+1,x+2)=69 THEN G
O SUB 530
 400 PRINT AT j,k;"  ";AT j+1,k;
"  "
 410 GO TO 50
 420 POKE 32155,16: POKE 32157,2
24: LET t=INT (RND*3)
 430 PRINT AT e,15; BRIGHT 1; IN
K 2;"RS";AT e+1,15;"TU": LET j=e
: LET k=15
 440 IF t=1 OR t=2 THEN BEEP .00
1,60: PRINT AT e+1,3; INK 7;b$:
IF ATTR (y+1,x+2)=7 THEN GO SUB
530
 450 PRINT AT e+1,3;c$
 460 IF t=0 OR t=2 THEN BEEP .00
1,60: PRINT AT e+1,17; INK 7;b$:
 IF ATTR (y+1,x-1)=7 THEN GO SUB
 530
 470 PRINT AT e+1,17;c$
 480 LET e=e+f
 490 IF e<3 OR e>15 THEN LET f=-
f
 500 PRINT AT j,k;"  ";AT j+1,k;
"  "
 510 IF e=y AND x=15 THEN GO SUB
 0530
 520 GO TO 50
 530 FOR y=y TO 15 STEP 3: PRINT
 AT y,x; INK 4;"AB";AT y+1,x; IN
K 3;"CD": BEEP .007,y: PRINT AT
y,x;"  ";AT y+1,x;"  ": NEXT y
 540 FOR o=1 TO 5: FOR p=7 TO 0
STEP -1: BEEP .003,p*2: BEEP .00
5,p: PRINT AT y,x; INK p;"CD";AT
 y+1,x; INK p;"AB": NEXT p: NEXT
 o
 550 LET men=men-1: PRINT AT 21,
30; INK 1;men: IF men=0 THEN PRI
NT AT 10,12; FLASH 1; INK 9;"
GAME  OVER": GO TO 570
 560 LET x=15: LET y=18: RETURN
 570 INPUT "WANT ANOTHER TRY (y/
n) ?";a$
 580 IF sc>hi THEN LET hi=sc
 590 IF a$="y" THEN GO SUB 610:
GO TO 50
 600 GO TO 9999
 610 BORDER 0: PAPER 0: CLS
 620 FOR g=2 TO 18 STEP 3: PRINT
 AT g,0; INK 5;"NNNNNNNNNNNNNNNN
NNNNNNNNNNNNNNNN";AT g,INT (RND*
27)+4;"  ": NEXT g
 630 PRINT AT 20,0; INK 5;"NNNNN
NNNNNNNNNNNNNNNNNNNNNNNNNNN"
 640 LET b$="-------------"
 650 LET c$="             "
 660 LET sc=0: LET men=5
 670 PRINT AT 21,0; INK 4;"SCORE
 ";sc;AT 21,12; INK 2;"HISCORE "
;hi;AT 21,25; INK 1;"MEN  ";men
 675 LET st=1
 680 LET x=15: LET y=18: LET c=0
: LET d=2: LET e=0: LET f=3
 690 LET r=0: LET s=0
 700 LET a=1: LET j=0: LET k=0
 710 RETURN
```

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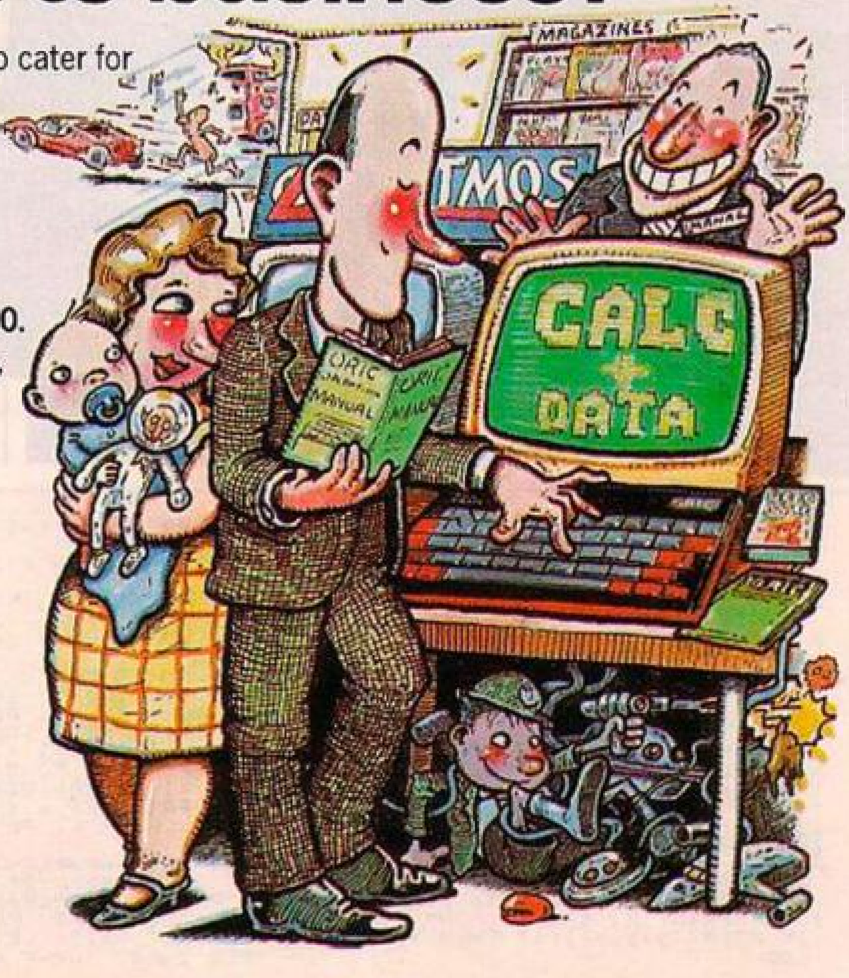
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TANSOFT



T Barrett shows you how the IRQ can speed up your games.

IRQ INTERRUPTS

THIS ARTICLE DESCRIBES how to use the IRQ for faster action on the CBM-64. First, what is an IRQ? Well, for those who are unfamiliar, an IRQ is a routine that is normally used for keyboard scanning, updating the internal clock, etc. However, it can be used to great advantage to the user because, by changing a couple of pointers, you can get the IRQ to deal with your routine and then pick up where it left off.

The two pointers in question are 788 ($0314 hex) and 789 ($0315 hex). These two addresses hold the LO and HI byte respectively of the start address of a particular routine, which is referred to as a wedge.

To get a better idea of how to set up an IRQ wedge, you will need a machine code monitor, but if you do not have one, you will have to make do with the Basic loader.

The following example shows how to set up an IRQ wedge using a monitor:

```
. , C000 78       SEI
. , C001 A9 0D    LDA # $0D
. , C003 8D 14 03 STA $0314
. , C006 A9 C0    LDA # $C0
. , C008 8D 14 03 STA $0315
. , C00B 58       CLI
. , C00C 60       RTS
. , C00D (Your routine starts here)
```

(continued on next page)

```
10 REM ************************************
15 REM **         ASTRO/DODGE            **
20 REM **                                **
25 REM **   (C)COPYRIGHT     1984        **
30 REM **                                **
35 REM **         T.BARRETT.             **
40 REM **                                **
45 REM ************************************
50 PRINTCHR$(147)CHR$(129)
55 POKE53281,0:POKE53280,0
60 GOSUB475:REM SET UP M/C & SPRITES
65 GOSUB340:REM TITLE PAGE
70 SYS(49152)
75 PRINTCHR$(147):SP=35:SE$="000000"
80 POKEVC+21,63:SC=0
85 PY(1)=VC+3:PX(1)=VC+2
90 PY(2)=VC+5:PX(2)=VC+4
95 PY(3)=VC+7:PX(3)=VC+6
100 PY(4)=VC+9:PX(4)=VC+8
105 PRINTCHR$(19)TAB(13)"* ASTRO/DODGE *"
110 PRINTCHR$(158)
115 REM ------ MAIN LOOP ------
120 SC=SC+1:S$=STR$(SC)
125 S1$=RIGHT$(S$,LEN(S$)-1)
130 SC$=LEFT$(SE$,6-(LEN(S1$)))+S1$
135 IFSC>HITHENHI=SC:HI$=SC$
140 POKEVC+30,0
145 PRINTCHR$(19)"SCORE:"SC$
150 PRINTCHR$(19)TAB(29)"HIGH:"HI$
155 SP=SP-.1:IFSP<10THENSP=10
160 D=PEEK(VC+30)
165 IFD=3ORD=5ORD=9ORD=17ORD=33THEN205
170 POKE56325,INT(SP)
175 POKEVC+37,INT(RND(1)*15+1)
180 POKEVC+38,INT(RND(1)*15+1)
185 FORI=1TO4
190 IFPEEK(PY(I))>230THENPOKEPX(I),INT(RND(1)*210+40)
195 NEXTI
200 GOTO120
205 REM ---- SORRY YOU'VE BEEN HIT ----
210 S=54272:FORI=0TO24:POKES+I,0:NEXT
215 POKES+5,31:POKES+6,15:POKES+4,129
220 POKEVC+23,63:POKEVC+29,63
225 POKE2040,15:FORK=15TO0STEP-.2
230 POKEVC+28,63:POKEVC+39,INT(RND(1)*15)
235 POKES+24,K:POKES,100:POKES+1,5
240 POKEVC+37,INT(RND(1)*15+1)
245 POKEVC+38,INT(RND(1)*15+1)
250 NEXTK
255 POKES+4,0:POKEVC+21,0
260 PRINTCHR$(19)
265 FORJ=1TO4:PRINT:NEXTJ
270 PRINTTAB(5)"***********************************"
275 PRINT:PRINT
280 PRINTTAB(5)"*** SORRY YOU'VE BEEN HIT! ***"
285 PRINT:PRINT
290 PRINTTAB(5)"***      -GAME  OVER-       ***"
295 PRINT:PRINT
300 PRINTTAB(5)"***   ANOTHER GO?  (Y/N)    ***"
305 PRINT:PRINT
310 PRINTTAB(5)"***********************************"
315 GETK$:IFK$<>"Y"ANDK$<>"N"THEN315
320 IFK$="Y"THENGOSUB565:GOTO75
325 POKE49154,49:POKE49157,234
330 SYS(49152):PRINTCHR$(147)CHR$(154)
335 POKE53280,14:POKE53281,6:POKE56325,42:END
340 REM ------- TITLE PAGE -------
345 PRINTCHR$(19);
350 PRINTTAB(12)" ╭╮ ╭╮ ┬ ╭╮ ╭╮"
355 PRINTTAB(12)"| ||  | | || |"
360 PRINTTAB(12)"| ||  | | || |"
365 PRINTTAB(12)"| ||  | | || |"
370 PRINTTAB(12)"| ||  | | || |"
375 PRINTTAB(12)"| ||  | | || |"
380 PRINTTAB(12)"| ||  | | || |"
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405 PRINTTAB(12)"| |  | | || |"
410 PRINTTAB(12)"| |  | | || |"
415 PRINTTAB(12)"| |  | | || |"
420 PRINTTAB(12)"| |╰╯ | | |╰╯"
425 PRINTTAB(12)"──────────────────"
430 PRINTTAB(12)"** D O D G E **"
435 PRINTTAB(12)"──────────────────"
440 PRINT:PRINT
445 PRINTTAB(4)"(C)COPYRIGHT   T.BARRETT.   1984"
450 PRINT:PRINT
455 PRINTTAB(6)"** PRESS TRIGGER TO START **"
460 IFPEEK(56320)<>111THEN460
465 RETURN
470 REM ------ SET UP MACHINE CODE ------
475 FORI=49152TO49220
480 READJ:CC=CC+J
485 POKEI,J:NEXTI
490 READJ:IFCC<>JTHENEND
495 DATA120,169,13,141,20,3,169,192
500 DATA141,21,3,88,96,238,3,208,238,5
505 DATA208,238,7,208,238,9,208,238,11
510 DATA208,173,0,220,201,123,240,7
515 DATA201,119,240,16,76,49,234,173,0
520 DATA208,201,50,240,3,206,0,208,76
525 DATA49,234,173,0,208,201,255,240,3
530 DATA238,0,208,76,49,234,0
535 DATA8873:REM*CHECKSUM*
540 REM ------- SET UP SPRITES -------
545 FORK=0TO2
550 FORI=0TO62:READJ
555 POKEI+(64*(13+K)),J
560 NEXTI,K
565 POKE2040,13
570 FORI=0TO4:POKE2041+I,14:NEXT
575 VC=53248
580 POKEVC+28,62:POKEVC+37,7
585 POKEVC+38,1:POKEVC+39,12
590 POKEVC+40,8:POKEVC+41,8
595 POKEVC+42,8:POKEVC+43,8
600 POKEVC+44,8
605 POKEVC+23,62:POKEVC+29,62
610 POKEVC,155:POKEVC+1,150
615 POKEVC+2,55:POKEVC+3,170
620 POKEVC+4,40:POKEVC+5,240
625 POKEVC+6,100:POKEVC+7,200
630 POKEVC+8,200:POKEVC+9,80
635 POKEVC+10,60:POKEVC+11,50
640 DATA 0,24,0,0,24,0,0
645 DATA 24,0,0,24,0,0,60
650 DATA 0,0,60,0,0,60,0
655 DATA 0,126,0,2,231,64,3
660 DATA 219,192,3,255,192,7,255
665 DATA 224,15,255,240,15,255,240
670 DATA 15,60,240,14,60,112,12
675 DATA 24,48,0,60,16,0,126
680 DATA 0,0,219,0,0,0,0
685 :
690 DATA 0,0,0,0,16,0,0
695 DATA 152,0,0,152,0,0,152
700 DATA 0,0,152,0,2,154,0
705 DATA 2,86,0,2,86,0,2
710 DATA 86,0,2,86,0,9,117
715 DATA 128,9,117,128,9,117,128
720 DATA 10,86,128,2,86,0,2
725 DATA 154,0,2,170,0,0,160
730 DATA 0,0,0,0,0,0,0
735 :
740 DATA 0,0,0,0,0,0,0
745 DATA 60,0,0,255,0,3,87
750 DATA 240,15,89,124,13,169,152
755 DATA 15,90,124,3,89,252,3
760 DATA 106,112,13,153,156,15,213
765 DATA 112,0,247,192,0,63,0
770 DATA 0,0,0,0,0,0,0
775 DATA 0,0,0,0,0,0,0
780 DATA 0,0,0,0,0,0,0
785 RETURN
```

```
10 REM COMMODORE 64
20 REM IRQ INTERRUPT
30 REM DEMONSTRATION PROGRAM
100 DATA120,169,13,141,20,3,169,192
110 DATA141,21,3,88,96,173,0,220,201
120 DATA126,240,15,201,125,240,24,201
130 DATA123,240,33,201,119,240,42,76
140 DATA49,234,173,1,208,201,25,240,3
150 DATA206,1,208,76,49,234,173,1,208
160 DATA201,220,240,3,238,1,208,76,49
170 DATA234,173,0,208,201,20,240,3,206
180 DATA0,208,76,49,234,173,0,208,201
190 DATA255,240,3,238,0,208,76,49,234
210 DATA11279:REM*CHECKSUM*
300 FORI=49152TO49238
310 READJ:CC=CC+J
320 POKEI,J:NEXTI
330 READJ:REM*CHECKSUM*
340 IFCC<>J THEN PRINT"DATA ERROR"
350 SYS(49152)
400 REM*DEMONSTRATION PROGRAM*
410 FORI=0TO62:POKEI+832,255:NEXTI
420 POKEVC+21,1:POKEVC+39,14
440 POKEVC,150:POKEVC+1,120
450 END
```

(continued from previous page)

The next routine will allow you to move a sprite around the screen under joystick control; however, this does not include movement on the extreme right of the screen.

Included in the routine is a short demo that sets up a sprite to show off its potential.

After typing it in and saving it, type Run and, after a few seconds, Ready will appear on the screen plus a square sprite in the centre. Now plug in a joystick in port 2 and move the joystick in all directions. Hey Presto, faster movement. You will notice that this routine runs independent of any Basic program.

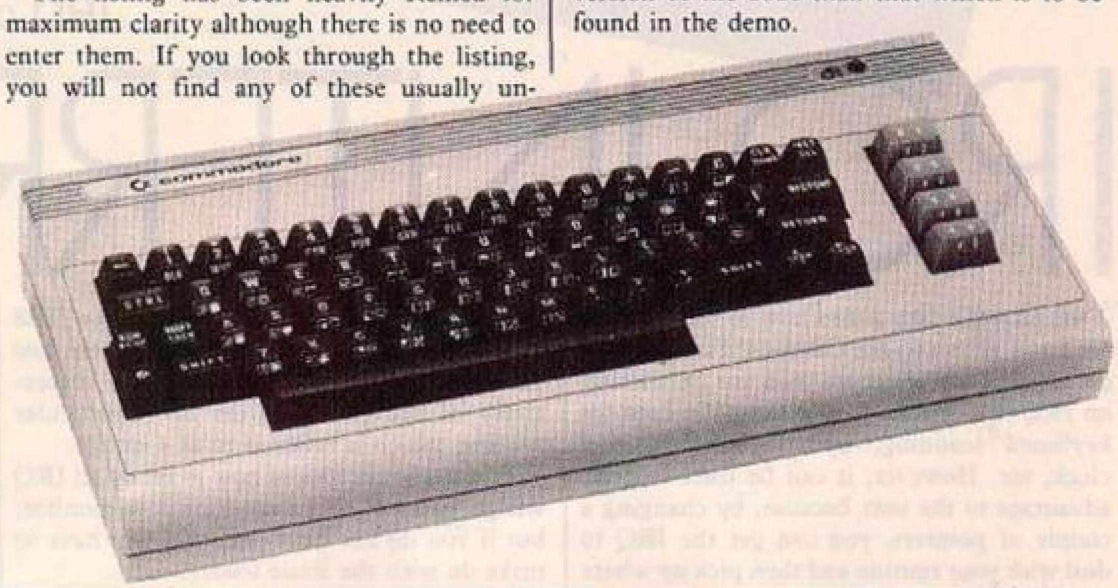
The IRQ can be speeded up even faster by

POKE 56325, (0 — 50)

The lower the number, the faster the action.

The main program is a complete game that can be very enjoyable. The idea of the game is to fly your spacecraft as far as you can through a storm of rather large fireballs that fall relentlessly from the top of the screen, building up speed as they go, until it is near on impossible to avoid them. The game uses multi-color sprite characters for greater effect.

The listing has been heavily Remed for maximum clarity although there is no need to enter them. If you look through the listing, you will not find any of these usually unreadable control characters, instead, I have used CHR$ functions in their place which goes to show that you don't really need them. The program contains a slightly different version of the code than that which is to be found in the demo.



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QL OR BBC?

I was planning to buy a BBC Micro, to upgrade from my 16K ZX-81. However, now that I have seen advertisements for the Sinclair QL, and have read several reviews, I think I will get a QL instead. I know that although you could not load ZX-81 programs directly into a Spectrum, most of them would work fairly well if just typed in. Is this true for the QL? I would hate to lose all the hours I've put into writing my ZX-81 programs.

Graham Westbrook,
Tintagel.

THE QL USES A LANGUAGE which Uncle Sir Clive and his crew have called SuperBASIC. I suspect that the name was given only to reassure people who know how to program in Basic, so they wouldn't get the feeling they were going to have to learn a new language. Sinclair Research have tried to, in the words of Clive's sidekick Nigel Searle, 'make right all the things which were wrong with Basic'. It is a brave attempt, and one which should be applauded, given the immense impact any computing decision made by Sinclair can have.

Acorn tried it with the Atom and produced a strange language which was strongly defended by those who learned to use it. It proved to be very flexible, and formed the basis of the Basic supplied with the BBC Micro. But it did not ever really take off. SuperBASIC will enjoy wide use, simply because of the zillions of QLs which will be sold. However, although you will be able to transfer some of your ZX-81 knowledge, there is no real question of typing in programs direct, and hoping they will run.

The QL user guide is a frightening document, much bigger than the computer. However, once you realise that half of it refers to the software supplied with the machine — Quill, Abacus, Easel and Archive — it seems to become more manageable. You'll recognise many of the commands — such as Beep and CLS — though others — like Baud, Block for window definition and CSize for setting the character size — will be new, although not particularly difficult to understand. However, like BBC Basic (but going beyond its somewhat modest testing-the-water approach) SuperBASIC is a disciplined, structured language, making much use of defined procedures and functions.

Its numerical range is extraordinary (10^{-615} to 10^{615}) and in contrast to some Basics which get excited at strings more than 128 or 255 characters long, SuperBASIC is understood to accept strings up to 32K long!

The string handling — using To instead of the Left$, Mid$ and Right$ of most other Basics — is the same as with the ZX machines. In conclusion, then, you'll find quite a bit you can take with you from the ZX computers, and a hell of a lot you'll need to learn from scratch if you're going to make the most of the QL's capabilities.

16K/48K DIFFERENCE

I have a 48K Spectrum. While typing in programs which contain machine-code routines, I have experienced difficulty in getting them to run if it was stated that the program was for the 16K Spectrum. Those that are for the 48K Spectrum run perfectly. Is there a difference between the machines which would cause this, and how can the problem be solved?

Andrew Torry,
Harare,
Zimbabwe.

THE LOCATION OF routines in machine code is vital, as is the destination of relative jumps. As has been shown by the large amount of correspondence by people who have succeeded in getting routines written for 48K machines to work on 16K Spectrums, there is no single answer which will apply for every routine.

On a 48K computer, for example, you may well be storing you machine code above address 61439 whereas the equivalent address on your 16K machine may be 28671.

PRINTER FOR ZX-81

I am attracted by the virtues of the Tandy CGP115 colour printer which was glowingly reviewed about a year ago in *Your Computer*. Can this printer be interfaced with the ZX-81? I wish to use the printer for word processing.

T C Hanson,
Southwick,
West Sussex.

THE SHORT ANSWER is Yes. Almost anything can be interfaced with almost anything else if you can be bothered to do so, and can afford to do so. However, before you start down the road to jury-rigged connections, it would be best to ask yourself a few questions. How important will this word processing be to you? If you're doing a lot of it, starting with a ZX-81 is hardly ideal. Is it worth buying a printer such as the one you mentioned (with colour!) to cripple it by joining it to a limited machine such as the ZX-81? Would it not be better to examine your needs, and then spend your money on a system which is — in the end — likely to produce far better results for you. Like the man who got confused when giving another man directions, I feel like ending up by saying 'If that's where you want to go, I wouldn't start from here.' Coupling a quality colour printer to your poor little ZX-81 is not a route guaranteed to lead you where you want to end up.

VIC-20 SOUND

I own a Vic-20, and am very interested in upgrading a number of programs I have written by adding to the sound. I have used all of the routines in the manual — the "whistling birds" and the "explosion" and the rest — but want to be able to produce sounds which are more like real synthesisers. Can you tell me how to do that?

Peter Dascoign,
Anstey,
Leicester.

THE ANSWER TO that question would possibly take up the whole of this issue of *Your Computer*. However, Philip Campbell, author of *Delving Deeper into your Vic-20*, suggests you could try a technique of rapidly switching the sound registers — or the volume register — on and off, or from one pitch to another. This is a very useful technique, he says, for sounds like motors or laser beams. A sample routine to show this is:

```
10 REM LASER
20 S1 = 36874:S2 = S1 + 1:S3 = S1
   + 2:N = S1 + 3:V = S1 + 4:
   POKEV,15
30 FOR Z = 1 TO 15: POKE S3.235
   + Z:POKE S2.238 + Z
40 POKE S3,0:POKE S2,0:NEXT
```

COMPATIBILITY

I have had an Oric now for just over a month. It is my first computer. I have seen user-defined graphics on the Spectrum and understand that it is possible to do the same thing on the Oric. However, I couldn't make the instructions from a Spectrum book work on the Oric. Are the computers that different? I managed to make several of the programs work fairly well, so why am I having trouble with graphics?

Brett Hale,
Chalfont St Giles.

PERHAPS YOU WERE just lucky with the programs you chose. Many of the very standard elements of the Basic language are almost identical from computer to computer. Other parts of the language, such as those controlling graphics, are wildly different. On the Spectrum, for example, the graphics are on an eight by eight grid, while those on the Oric — contrary to the claims made in one *Granada* book on the subject — are on a six by eight grid. The Oric characters are held in memory from locations 46080 to 48120, and you can Poke a new shape into place so that each time you would normally get, say, the 'X', you get instead a fierce alien. Although the techniques, in general, are the same for creating graphics on the Spectrum and the Oric, their implementation is quite different.

GOTO STATEMENT

I have a BBC Micro Model B and I have written a number of games on it in Basic. I previously owned a ZX-81. A friend of mine was looking at my programs — which all run pretty well — and became quite critical of the way I had written them. He said that using Goto was bad programming practice, and said I should use the BBC's procedures. Apart from the fact that I don't know how to use procedures — there aren't any on the ZX-81, on which I learned to program — I can't see anything wrong with Goto. If the program works well, isn't that enough?

Simon Ross,
Newport,
Gwent.

THE ANSER IS partly yes, and partly no. The real argument against the use of Goto — an argument, by the way, which makes some people very, very excited and angry — arose in the 'old days' when Basic only allowed a Goto after an If/Then.

This means you could not do If something Then Let A=10 or If something then Print "string". As a result, programs used to leap all over the place, creating what was known poetically as spaghetti code. The programs were a nightmare to follow and debug.

However, now that we can follow an If/Then with practically anything, Gotos are often used to send programs round in endless loops, rather than to jump back and forth. A Repeat/Until sequence is much better for this on the BBC Micro. And you really should examine procedures, as they are quite simple to use. But, and this will surprise your critical friend, in many programs a procedure is *slower* than a Goto on the BBC Micro.

CORRECTION

Andrew Gallon from Walmer, Deal, Kent, writes to correct a recent printing error in Response Frame:

In the answer you gave to a question about how to tell the difference between a 48K Spectrum and a 16K one, you suggested entering directly DIM A$(40,000), on the assumption that a computer which accepted it (without an out of memory error message) was a 48K. The Spectrum will not accept the comma in the number, so it should read DIM A$(40000).

Another program to do this, which was supplied by Sinclair Research, is to enter PRINT PEEK 23733/4 — 15.75;"K". This will print 48K at the top of the screen if it is a 48K machine, and 16K at the top of the screen for a 16K machine.

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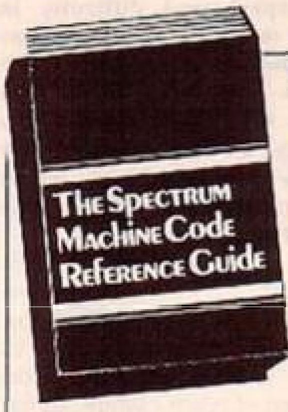
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This 170-page reference work for Spectrum machine code programmers contains a full disassembly of the Spectrum ROM, with details of the Microdrive and Interface 1. Features of the disassembler include: Zilog mnemonics are used, eg LD A, (HL) instead of MOV A, M; relative jumps show the signed decimal offset and the result; hex values are default and are printed without suffix; decimal values are preceded by a plus or minus sign; and some restart instructions are followed by data bytes. The absolute addresses of all system variables and several important routines have been named, using where possible the standard names shown in the manual. The chapter headings in the Microdrive/Interface 1 section of the book include the RS232 Interface; Microdrive Channel data; Local Area Network; Network Algorithms; System Variables; and a summary of functions. **This book is a must reference work for serious Spectrum machine code programmers.**

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Ack-ack

SPECTRUM

A M Tucker,
Charminster,
Dorset.

THE GRAPHICS animation in this game is very smooth, through the use of the excellent machine-code routine by Robert Newman, *Your Computer*, April 1983. This is used for nearly all the graphics, including the introductory title.

In the game, a spaceship descends slowly in a series of diagonal slants across the screen. You have an ack-ack gun with controls for range and elevation. The shell travels in a parabola, making aiming more difficult, especially at extreme range. Also, the spaceship has only one vulnerable spot: a hit elsewhere is quickly repaired. If you succeed in destroying the spaceship, your score will depend mainly on the height at which you did it.

The secion 1000-1120 should be entered first and saved, together with the bytes. Then the rest of the program can be entered, and saved, using

SAVE "name" LINE 1

The bytes are then put on the tape after the main program, using the name and code details as in line 410 of the main program. On loading, the program should load the bytes and self-run.

The first address in the machine code must be the address immediately following RAMtop, which will have to be set in a 16K Spectrum to not more than 32399. The machine code would then start at 32400, and the calling addressd will be Rand Usr 32411. The various Poke addresses will also have to be changed.

```
  10 REM    Ack Ack
        by A.M.Tucker,
          Charminster.

  20 CLEAR 61149: GO SUB 410: IN
K 0: CLS
  30 PRINT TAB 10;"* ACK ACK *"'
''"   Use n & m for range."'"
Use a & z for elevation."'"   Us
e x to fire."
  40 PRINT AT 10,0;"To destroy t
he spaceship,it must be hit exac
tly in the centre:   damage from
 other hits will be  repaired."
  50 INPUT "To start choose sing
le shot       or automatic (s/a)
 - ";f$
  60 CLS : PLOT 255,15: DRAW -25
5,0: DRAW 18,0: DRAW 0,10: DRAW
25,0
  70 RESTORE 80: FOR n=61150 TO
61155: READ a: POKE n,a: NEXT n:
 PRINT INK 0;: RANDOMIZE USR 611
61
  80 DATA 120,27,32,12,1,13
  90 PRINT INK 0;AT 19,30;"S": R
EM graphics S
 100 LET hit=0: LET rd=0: LET e=
32: LET r=16: LET s=5: LET t=0
 110 FOR n=0 TO 670: LET x=(230-
n)*(n<231)+(n-230)*(n>230 AND n<
461)+(690-n)*(n>460)
 120 LET y=INT (170-n*.225): IF
y<24 THEN LET y=24
 130 RESTORE 130: FOR p=61150 TO
 61155: READ q: POKE p,q: NEXT p
: DATA x,y,24,9,1,1: PRINT INK 0
;: RANDOMIZE USR 61161
 140 IF n>600 THEN NEXT n
 150 IF INKEY$="x" AND s=6 AND f
$="s" THEN GO TO 270
 160 IF s<5 THEN GO TO 240
 170 IF (s/4+t)>48 THEN LET t=0:
 POKE USR "a",0: POKE USR "a"+1,
0
 180 LET e=e+(INKEY$="a")*(e<35)
-(INKEY$="z")*(e>1)
 190 LET r=r+(INKEY$="m")*(r<24)
-(INKEY$="n")*(r>3)
 200 PRINT AT 21,21;"E:";e*2+20;
" ";"R:";r*4: LET f=r*.33
 210 LET b=INT ((s(e)-2.7*f)*f+1
5.5): IF b>175 THEN LET b=175
 215 IF b<33 THEN LET b=33
 220 LET a=245-INT (c(e)*f+.5):
IF a<0 THEN LET a=0
 230 IF s>4 AND INKEY$="x" THEN
INK 2: LET s=0: POKE 61155,9: GO
 TO 300
 240 IF s<4 THEN INK s+2: POKE 6
1155,9+s: GO TO 330
 250 IF s=4 THEN LET s=5: POKE 6
1154,0: GO TO 330
 260 LET s=s+1
 270 LET t=t+1-50*(t=50): NEXT n
 280 PRINT INK 0;: RANDOMIZE USR
 61161
 290 DRAW 1,0: FOR n=1 TO 10: DR
AW 0,-1: PAUSE 6: NEXT n: GO TO
370
 300 IF a=x+8 AND b=y THEN GO TO
 350
 310 IF a>x+1 AND a<x+15 AND b=y
 THEN POKE USR "a"+(a>x+8),3: LE
T hit=hit+10
 320 BEEP .05,-56: LET rd=rd+1
 330 POKE 61150,a: POKE 61151,b:
 POKE 61152,8: POKE 61153,8
 340 RANDOMIZE USR 61161: INK 0:
 GO TO 260
 350 POKE 61155,5: PRINT INK 2;:
 RANDOMIZE USR 61161: BEEP .1,-4
0: BEEP .1,-48: BEEP .1,-56
 360 FOR p=1 TO 80: NEXT p: POKE
 61154,0: RANDOMIZE USR 61161: L
ET hit=hit+20
 370 INK 0: PRINT AT 21,0;"Score
 = ";hit+y-24;TAB 14;"Rounds fir
ed = ";rd
 380 INPUT "Another game? (y/n)
 - ";q$
 390 IF q$="y" THEN CLS : POKE U
SR "a",0: POKE USR "a"+1,0: GO T
O 30
 400 STOP
 410 LOAD "ackack"CODE 61156,200
: CLS : PRINT AT 10,8;"Switch of
f tape"
 420 DIM s(36): DIM c(36): FOR n
=10 TO 45: LET s(n-9)=SIN (n*.03
5)*45: LET c(n-9)=COS (n*.035)*4
5: NEXT n
 430 CLS : BORDER 5: PRINT PAPER
 4;AT 21,0,,
 440 POKE 61152,8: POKE 61153,8:
 POKE 61154,1
 450 INK 2: LET a=1: FOR i=0 TO
2: POKE 61155,a
 460 PRINT AT 20,8;"A" AND i<1;T
AB 14;"C" AND i<2;TAB 20;"K" AND
 i<3: PAUSE 30: BEEP .07,-48
 470 FOR n=0 TO 80: POKE 61150,6
4+i*48-n/2.5*i: POKE 61151,n+15:
 RANDOMIZE USR 61161: NEXT n
 480 PRINT AT 20,8;"A" AND i<1;T
AB 14;"C" AND i<2;TAB 20;"K" AND
 i<3: PAUSE 30: BEEP .07,-48
 490 FOR n=0 TO 80: POKE 61150,6
4+i*48+n/2.5*(2-i): POKE 61151,n
+15
 500 RANDOMIZE USR 61161: NEXT n
: LET a=3+8*i: NEXT i
 510 PLOT 60,84: DRAW 0,14: DRAW
 112,0: DRAW 0,-14: DRAW -112,0
 520 RESTORE 530: FOR n=USR "a"
TO USR "a"+159: READ a: POKE n,a
: NEXT n: RETURN
 530 DATA 0,0,0,3,-1,192,15,-1,2
40,9,36,144,15,-1,240,63,-1,-4,6
3,-1,-4,4,0,32,14,0,112,0,0,0,0,
0
 540 DATA 0,145,0,4,82,32,2,0,64
,0,76,0,28,1,56,0,200,0,2,0,64,4
,82,32,0,145,0,0,0,0,0,0
 550 DATA 0,0,20,56,28,40,0,0,0,
16,4,64,2,32,8,0,24,66,1,128,1,1
28,3,84,8,64,2,128,0,65,0,36
 560 DATA 56,28,0,0,84,42,8,0,18
6,93,28,0,84,42,a,28,186,73,28,4
2,84,8,42,93
 570 DATA 16,62,28,42,16,-1,42,9
3,19,-1,136,42,63,-1,200,8,127,-
1,a,-4,-1,a,a,a
 580 DATA 128,64,32,16,14,30,60,
-1,0,112,80,112,0,0,0,0
 998
 999 REM * Hex loader & code *
1000 LET a=10: LET b=11: LET c=1
2: LET d=13: LET e=14: LET f=15
1010 FOR n=0 TO 9: READ a$: FOR
i=1 TO 20
1020 POKE 61155+n*20+i,VAL a$(i*
2-1)*16+VAL a$(i*2): NEXT i: NEX
T n
1030 DATA "000000000dd2ab25cdd2
32a7b5cdd5e051dcb23"
1040 DATA "cb23cb23160019ebdd4e0
0dd4601dd7e03f5c5dd"
1050 DATA "7e02dd7706cdaa22dd770
7dd34072fe6073cdd77"
1060 DATA "08d5e5cddb0be1d1ddcb0
44620050100001805eb"
1070 DATA "46234eebdd360908dd360
a097edd3507280907dd"
1080 DATA "350add350720f7cb21cb1
017dd350add35062013"
1090 DATA "dd350a280607dd350a20f
a77c1f1053d209bc9dd"
1100 DATA "3509200addcb04462804e
b231825dd350820ccdd"
1110 DATA "350a280607dd350a20fa7
723d5e5f5cddb0bf1e1"
1120 DATA "d1dd360808dd360701189
94eebdd36090818d300"
```

Bomb squad

ZX-81

D. Green,
Ashford,
Kent.

THIS PROGRAM is a fast flicker-free machine-code game for the 16K ZX-81. The idea behind the game is original, and in it you have to get to several bombs that are lying around, represented on the screen by flashing numbers. If a bomb reaches zero then it will explode, destroying everything next to it, and one or two more bombs will appear to replace it. You lose a life every time you get caught in one of these explosions, but get an extra one for every 10000 points that you score. Scoring for each bomb reached is proportional to how near it is to exploding. When all of the bombs have been defused you get some bonus points,

(continued on next page)

(continued from previous page)

more bombs appear, and the game gets faster.

To enter the program you will need a line 1 Rem statement at least 640 characters — five complete lines — and then to Edit it to make four lines of this length. Then type in, as direct commands:

Poke 16510,0
Poke 16511,146
Poke 16512,2

This will make them into one big line.

Next you will have to type in a hex loader, preferably one with a checksum. Then enter the machine code shown in listing 1. Do not include any spaces. This should not take too long as the program has been made as short as possible. When you have finished this, type in the Basic program in listing 2 that displays the instructions and sets up the data for the game — the instructions are optional but make sure that the first-declared variable is the string A$ with at least 66 characters in it, otherwise the machine code will crash when you call it. Save the completed program on tape and then try out the game.

If the program does not work or you want to modify it, then the following table should come in useful. It shows what every section of the machine code does. So if, for example, the program only gets as far as drawing the border then the error is probably in the Bombprint routine, and you will only have to check the hex codes from 16514 to 16579, instead of the whole program.

Useful addresses that you can Poke are 16605 which is the number of bombs at the start of the game and 16610 which is the speed of the game.

Name:	Function:	Start:
1. Bombprint	Subroutine to print a bomb at a random position.	16514
2. Set	Sets various variables (score etc.).	16580
3. Borderprint	Draws border and prints bombs by calling Bombprint.	16636
4. Bombscan	Counts down all bombs on screen — if any bomb has got to zero then prints explosion and new bomb.	16675
5. Move	Moves the player and checks if hit by explosion.	16768
6. Erase	Erases all explosions on screen, waits for a short time, and then jumps to Bombscan.	16849
7. Explosion	Prints a hi-res explosion and subtracts a life.	16907
8. Endgame	Prints "Game Over" and returns to Basic.	16954
9. Allgone	Prints "All Bombs Defused etc." and starts new wave.	16975
10. Score	Subroutine to add 10 to score and to check for a bonus life.	17096

Listing 1. The machine code.

```
16514:ED 5B 40 40 13 1A E6 1F
                         =762
16522:3C 3C FE 1E 30 F6 2A 0C
                         =752
16530:40 23 B7 28 04 23 3D 20
                         =454
16538:FC 13 1A E6 1F 3C 3C FE
                         =932
16546:13 30 F6 D5 11 21 00 B7
                         =759
16554:28 04 19 3D 20 FC D1 7E
                         =749
16562:B7 20 D1 13 1A E6 03 B7
                         =885
16570:28 F9 C6 A2 77 ED 53 40
                         =1152
16578:40 C9 2A 0C 40 11 5A 01
                         =491
16586:19 22 3C 40 3A 34 40 5F
                         =452
16594:3A 35 40 E6 07 57 ED 53
                         =819
16602:40 40 3E 05 32 3F 40 3E
                         =434
16610:0A 32 3E 40 2A 10 40 11
                         =325
16618:03 00 19 E5 01 01 15 CD
                         =465
16626:F5 08 E5 D1 E1 01 1E 00
                         =947
16634:ED B0 2A 0C 40 3E 80 06
                         =727
16642:20 23 77 10 FC 11 1F 00
                         =502
16650:06 13 23 23 77 19 77 10
                         =374
16658:F9 23 06 20 23 77 10 FC
                         =744
16666:3A 3F 40 47 CD 82 40 10
                         =671
16674:FB 2A 0C 40 06 14 C5 23
                         =627
16682:7E FE 76 28 4E E6 7F FE
                         =1227
16690:1C 38 F4 FE 26 30 F0 7E
                         =1034
16698:FE 80 30 05 C6 7F 77 18
                         =903
16706:E6 D6 80 77 FE 1C 20 DF
                         =1228
16714:E5 11 22 00 AF ED 52 3E
                         =836
16722:08 77 23 77 23 77 11 1F
                         =483
16730:00 19 77 23 23 77 19 77
                         =477
16738:23 77 23 77 CD 82 40 ED
                         =944
16746:5B 40 40 13 1A ED 53 40
                         =648
16754:40 E6 0F FE 0F CC 82 40
                         =976
16762:E1 18 AC C1 10 A6 2A 3C
                         =900
16770:40 7E FE 08 CA 0B 42 11
                         =748
16778:00 00 3E EF DB FE CB 67
                         =1080
16786:20 03 11 21 00 CB 5F 20
                         =415
16794:03 11 DF FF CB 57 20 01
                         =821
16802:13 3E F7 DB FE CB 67 20
                         =1139
16810:01 1B 36 00 19 7E FE 08
                         =495
16818:CA 0B 42 FE 80 20 04 2A
                         =739
16826:3C 40 AF B7 28 0C E6 7F
                         =891
16834:47 3E 26 90 47 CD C8 42
                         =857
16842:10 FB 36 3D 22 3C 40 16
                         =562
16850:00 2A 0C 40 06 14 23 7E
                         =305
16858:FE 76 28 1A FE 08 20 02
                         =734
16866:36 00 FE 1C 20 02 36 00
                         =424
16874:7E E6 7F FE 1C 38 E7 FE
                         =1306
16882:26 30 E3 14 18 E0 10 DE
                         =819
16890:7A B7 CA 4F 42 3A 3E 40
                         =836
16898:47 0B 78 B1 20 FB C3 23
                         =892
16906:41 01 00 19 36 BD 0B 78
                         =465
16914:ED 47 36 3D B1 20 F5 3E
                         =939
16922:1F ED 47 36 00 01 16 15
                         =437
16930:CD F5 08 7E 3D 77 FE 1C
                         =1046
16938:CA 3A 42 2A 0C 40 11 5A
                         =551
16946:01 19 22 3C 40 C3 D1 41
                         =653
16954:01 0A 0A CD F5 08 E5 2A
                         =750
16962:10 40 11 3C 00 19 D1 01
                         =392
16970:09 00 ED B0 C9 01 07 0A
                         =841
16978:CD F5 08 E5 2A 10 40 11
                         =826
16986:21 00 19 D1 01 11 00 ED
                         =522
16994:B0 E5 01 0B 0C CD F5 08
                         =887
17002:EB E1 01 0A 00 ED B0 06
                         =890
17010:64 CD C8 42 10 FB 3A 3F
                         =959
17018:40 C6 05 FE 9B 20 02 D6
                         =924
17026:05 32 3F 40 3A 3E 40 D6
                         =580
17034:03 FE FE 20 02 C6 03 32
                         =796
17042:3E 40 01 00 00 0B 78 B1
                         =435
17050:20 FB 01 1E 15 CD F5 08
                         =793
17058:7E 3C FE 26 20 02 3E 1C
                         =602
17066:77 2A 0C 40 E5 11 5A 01
                         =574
17074:19 22 3C 40 E1 06 14 23
                         =469
17082:7E FE 76 20 05 10 F8 C3
                         =994
17090:FC 40 36 00 18 F1 C5 E5
                         =1061
17098:2A 0C 40 11 8F 02 19 46
                         =423
17106:E5 23 23 23 7E 3C FE 26
                         =812
17114:20 05 36 1C 2B 18 F5 77
                         =550
17122:E1 7E B8 28 09 01 16 15
                         =828
17130:CD F5 08 7E 3C 77 3A 35
                         =674
17138:40 5F 3A 34 40 E6 0F 57
                         =665
17146:ED 53 40 40 E1 C1 C9 1C
                         =1095
```

Listing. 2. The Basic program.

```
   0 REM ...MACHINE CODE...
   5 LET A$="SCORE 0000000  LIVE
S:3  WAVE:1[illegible]"
  10 PRINT TAB 8;"BOMB SQUAD";TA
B 6;"[illegible]";TAB 4;"(C)D.GRE
EN 1984"
  20 PRINT ,,"YOU HAVE TO GET TO
 THE BOMBS    BEFORE THEY COUNT
DOWN TO ZERO  AND EXPLODE(BE VER
Y CAREFUL NOT TO GET CAUGHT IN A
NY EXPLOSIONS)"
  30 PRINT ,,"YOU SCORE ACCORDIN
G TO HOW NEAR THE BOMB IS TO GOI
NG OFF.          ([illegible]=10 POINTS,[illegible]=90
POINTS)"
  40 PRINT ,,"YOU START OFF WITH
 3 LIVES,AND  GET AN EXTRA ONE F
OR 10000 PTS."
  50 PRINT ,,TAB 2;"USE ARROW KE
YS TO MOVE"
  60 PRINT ,,TAB 2;"[illegible]"
  70 IF INKEY$<>"" THEN GOTO 70
  80 IF INKEY$="" THEN GOTO 80
  90 CLS
 100 LET X=USR 16580
 110 GOTO 70
 240 SAVE "SQUA[illegible]"
 250 RUN
```

The hex loader.

```
  10 PRINT "START ADDRESS ?"
  20 INPUT S
  30 PRINT "FINISH ADDRESS ?"
  40 INPUT F
  50 FOR N=S TO F STEP 8
  60 LET T=0
  70 SCROLL
  80 PRINT N;" - ";
  90 INPUT A$
 100 PRINT A$;" = ";
 110 INPUT TOT
 120 PRINT TOT
 130 LET Z=0
 140 FOR K=1 TO LEN A$ STEP 2
 150 LET C=(CODE A$(K)-28)*16+CO
DE A$(K+1)-28
 160 LET T=T+C
 170 POKE N+Z,C
 180 LET Z=Z+1
 190 NEXT K
 200 IF TOT=T THEN GOTO 240
 210 SCROLL
 220 PRINT "ERROR - PLEASE ENTER
AGAIN"
 230 GOTO 60
 240 NEXT N
 250 STOP
```

Moving sprites

David Angier,
Leamington Spa,
Warwickshire.

CBM-64

USING SPRITES on the Commodore 64 is a very easy way of getting moving graphics, but if a Basic program has to control more than about three sprites then everything gets very slow and the arcade quality of the game drops rapidly. Instead of having to change the co-ordinates of a sprite continually, this program allows you to supply x/y velocities and let a machine code program looks after the rest.

Just type in program 1 — a loader program — to get the machine code added to a program.

The program is controlled by poking into locations 688 to 719. The first 16 locations are the x/y speeds, they are in the same order as the VIC registers so 688 is sprite #1 x Speed and 691 is sprite #2 y Speed. Then locations 704 to 719 are the x/y directions:— 255 is left/up, 0 is stationary, 1 is right/down and again they are in the same order as the VIC sprite registers.

Example: If you want sprite#2 to move down rapidly and left slowly to give a diagonal speed, then the following commands will do the job:

POKE 690,4 : REM SPRITE #2 X SPEED SLOW

```
POKE 691,1   : REM SPRITE#2 Y SPEED
               FAST
POKE 706,255: REM X DIRECTION LEFT
POKE 707,1   : REM Y DIRECTION DOWN
```

Also if the sprite is not to move in the x direction then set its direction to zero. The lower the speed value the faster it will go.

Program 2 is an example showing all eight sprites moving at once with a reasonable speed.

For technical buffs the source code is also shown with a few cryptic comments to help you understand. The general principle is redirecting the routine that updates the clock every 60th of a second to my own routine that decrements timers, and when zero moves the corresponding sprite in the right direction.

Program 1.

```
10 FOR I=0TO90:READA:POKE12*4096+I,A:NEXT
20 SYS12*4096
1000 DATA120,169,192;141,21,3,169,13,141,20,3,88,96,162,15,169,128
1010 DATA141,61,3,141,60,3,222,208,2,208,44,189,176,2,157,208,2
1020 DATA189,192,2,240,33,16,12,189,0,208,8,222,0,208,40,240,7
1030 DATA208,19,254,0,208,208,14,173,60,3,208,9,173,61,3,77,16
1040 DATA208,141,16,208,173,60,3,208,3,78,61,3,73,128,141,60,3
1050 DATA202,16,191,76,49,234
```

Program 2.

```
5 V=13*4096
10 FOR I=0TO90:READA:POKE12*4096+I,A:NEXT:REM ENTER MACHINE CODE
20 FOR I=0TO62:READA:POKE832+I,A:NEXT:REM SET UP SPRITE
25 FOR I=0TO31:POKE688+I,0:NEXT :REM CLEAR M/C REGISTERS
30 FOR I=0TO7:POKE2040+I,13:NEXT:REM SET SHAPES THE SAME
40 POKEV+21,255:FORI=1TO3:FORJ=1TO3:REM ENABLE SPRITES
50 S=(I*3+J-4)*2:IFS>9THENS=S-2:REM GET SPRITE NO IN S
60 POKEV+S,(I-1)*120:POKEV+S+1,(J-1)*115:REM GIVE A POS
70 IFJ=1THENPOKE704+S+1,1
80 IFJ=3THENPOKE704+S+1,255 :REM AND A
90 IFI=1THENPOKE704+S,1 :REM  DIRECTION
100 IFI=3THENPOKE704+S,255
110 NEXTJ,I
120 FORI=0TO15:POKE688+I,1:NEXT :REM SET ALL SPEEDS AT 1
130 FOR I=0TO7:POKEV+39+I,8+I:NEXT:REM SET UP COLOURS
135 POKEV+23,255:POKEV+29,255:REM ENLARGE THEM
140 SYS12*4096:REM ALL SYSTEMS GO
150 LIST:REM AND LIST PROG AT SAME TIME!!
999 REM MACHINE CODE
1000 DATA120,169,192,141,21,3,169,13,141,20,3,88,96,162,15,169,128
1010 DATA141,61,3,141,60,3,222,208,2,208,44,189,176,2,157,208,2
1020 DATA189,192,2,240,33,16,12,189,0,208,8,222,0,208,40,240,7
1030 DATA208,19,254,0,208,208,14,173,60,3,208,9,173,61,3,77,16
1040 DATA208,141,16,208,173,60,3,208,3,78,61,3,73,128,141,60,3
1050 DATA202,16,191,76,49,234
1999 REM SPRITE DEFINITION
2000 DATA0,127,0,1,255,192,3,255,224,3,227,224
2010 DATA7,217,240,7,223,240,7,217,240,3,231,224
2020 DATA3,255,224,3,255,224,2,255,160,1,127,64
2030 DATA1,62,64,0,156,128,0,156,128,0,73,0,0,73,0
2040 DATA0,62,0,0,62,0,0,62,0,0,28,0
```

Variable list

Neil Canham,
Colchester,
Essex.

SPECTRUM

THIS MACHINE-CODE PROGRAM for the 16K or 48K Spectrum lists all the variables so far defined by a Basic program, with the exception of arrays, to provide a feature often found on larger micros, but rarely present on those such as the Spectrum.

The name and contents of each numeric or string variable are printed and the name of each control variable only printed, in inverse video.

There are several methods of entering the code:

If you have an assembler then the opcodes can be entered. Note that the assembler used required line numbers — third column of listing. The final machine code should be stored at address 65195 for 48K Spectrum, or 32427 for 16K Spectrum. Alternatively, the hex codes in column 2 of the assembler listing can be entered using a standard hex-loader. Again, the code should be stored at, and run from the relevant address mentioned above. Either way, the code should be saved using

48K – SAVE "Variables" CODE 65195,173
16K – SAVE "Variables" CODE 32427,173

If you find any of this confusing, then enter the Basic program, which will lower RAMtop by the required amount, and Poke the code in automatically. The program will stop if it detects an error, using a built in check-sum. Finally, the code will be automatically saved to tape.

Whichever method of entry is used, the code should be loaded using

48K – Clear 65194 : LOAD"" CODE
16K – Clear 32426 : LOAD"" CODE

and called when required using

48K – Randomise Usr 65195
16K – Randomise Usr 32427

The Spectrum manual contains quite a lot of information about variables, hidden away in Chapter 24. There are six different types of variables, each stored in a different way. First, the code of the first letter of the variable name has 96 subtracted from it, so as to leave bits 5, 6 and 7 as zeros. These three bits are then used to identify each type of variable with its own unique code.

The contents of the next byte will depend upon the type of variable in question. If it is a numeric variable with a one-character name, then the next 5 bytes after the letter will contain the number, in 5-byte floating point form. If however, the numeric variable has a name of more than one character, then the first character is stored as mentioned, using code 101 for bits 5, 6 and 7. Then comes the second character, with bit 7 reset, up to the last character of the name, which has bit 7 set. This is followed of course by the number, in 5 byte floating point form again.

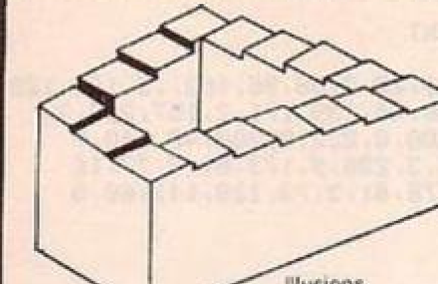
Control variables for For-Next loops have code 111, and are followed by 18 bytes of information about line number, present value, step etc. Strings are easiest to handle. First, the character of the name is stored, using code "010" as bits 5, 6 and 7. This is followed by 2 bytes containing the number of characters of the string, followed by the text itself.

The way in which arrays are handled is slightly more complex. However, anyone wishing to add their own array — handling routines to my program will find the necessary information on page 167 and 168 of the Spectrum manual.

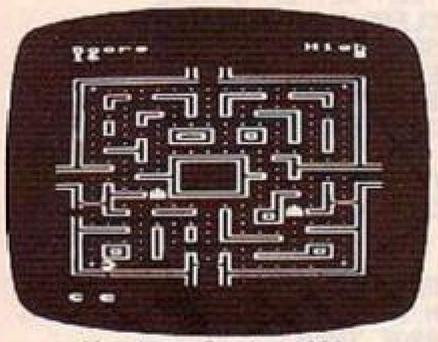
The program first checks to find out what type of variable it has found, then calls the relevant routine to either print the name and value of the variable, or just the name, in inverse video, of control variables for For-Next loops, or to jump over the correct number of bytes to find the next variable.

```
  10 REM variables list code
  20 REM N.R.CANHAM
  30 LET a=(PEEK 23730+256*PEEK
23731)-173
  40 CLEAR a
  45 LET s=0
  50 LET a=PEEK 23730+256*PEEK 2
3731
  55 FOR n=1 TO 173
  60 READ b: LET s=s+b: POKE a+n
,b: NEXT n
  70 DATA 62,2,205,1,22,205,107,
13,42,75,92,126,254,128,200,203,
127,32,6,203,111,40,52,24,85,203
,119,32,6,203,111,32,115,24,6,20
3,111,40
  80 DATA 2,24,8,35,94,35,86,25,
35,24,218,229,62,2,205,1,22,225,
62,20,215,62,1,215,126,238,160,2
```

(continued on page 169)



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(continued from page 167)

```
15,62,13,215,17,19,0,25,24,192,2
29,62,2,205,1,22,225,126,215
  90 DATA 62,36,215,62,61,215,62
,34,215,35,70,35,35,126,215,35,1
6,251,62,34,215,62,13,215,24,157
,229,62,2,205,1,22,225,126,203,1
75,215,62,61,215,35,126,35,94,35
 100 DATA 86,35,78,35,70,35,229,
205,178,42,205,227,45,225,62,13,
215,24,216,229,62,2,205,1,22,225
,126,238,224,215,35,126,203,127,
32,3,215,24,247,203,191,215,24,2
04
 110 IF s<>18235 THEN PRINT "Err
or has occured. Please check cod
e": STOP
 150 SAVE "variables"CODE a+1,17
3
```

Hopit

Andrew Watson,
Glossop,
Derbyshire.

THIS IS A GAME program for the Dragon 32, written largely in Basic, with machine code subroutines and controlled by the right-hand joystick.

The game is formed by a pyramid of green cubes over which the hopper can roam under control of the joystick in an attempt to avoid the red bounding ball which can only move downwards. When a ball reaches the bottom of the pyramid, a new one is introduced at the top. The hopper, in avoiding the bouncing ball, must hop from cube to cube changing each green-topped one to blue, until all are changed, when a new game is started, and a bonus is added to the score.

If the hopper fails to avoid the ball, then a life is lost, the screen is refreshed and the game restarts. This process will continue until all three lives are lost, when the game will end.

Line 1500 contains a Poke which alters the machine speed. On certain versions of the Dragon 32, the program will crash, if the machine speed is altered, and therefore the Poke should be removed from line 1500 on those machines.

The program listing shows a £ symbol, this is printer interpretation of a hash #. Save the program under the name HOPIT before running it, as an error in the machine code could cause the program to crash.

The game is loaded and operated as follows:

Type CLOAD "HOPIT". On completion of successful load — screen display OK, then type RUN. The program will be activated, a screen display of the program name and HOPIT symbol will appear on the screen for eight seconds while the program constructs the high-resolution screen, after which the display changes to ask whether the inbuilt program instructions are to be displayed, before proceeding with the game.

The program description is as follows:

150-690	Draw hi-res screen.
700	Program variables.
710-1120	Main instruction sequence.
1130-1200	Life loss and screen refresh.
1210-1430	Game over and high score table.
1440-1520	Completed screen, bonus update.
1530-1660	In-built instructions.
1670-2020	Title screen.
2020-2070	Machine code.

To alter the degree of difficulty, the variable LE in line 700 should be altered in steps of 50. Increasing the value reduces difficulty, and conversely decreasing LE increases difficulty.

```
110 CLS
120 CLEAR500,31999:PCLEAR8
130 DIMA(10),A$(10):FORF=1TO10:A(F)=10000-(F*1000):A$(
F)="HOPIT":NEXTF
140 GOSUB1670
150 DIMQQ(3),WW(3),EE(3),RR(3)
160 PMODE3,1:PCLS
170 DRAW"BM108,20;C3;E15F15G15H15F15E15D15G15U15D15H15
U15"
180 DRAW"BM108,35;C3;G15F15E15D15G15U15D15H15U15"
190 DRAW" BM93,65;C3;G15F15E15D15G15U15D15H15U15"
200 DRAW"BM78,95;C3;G15F15E15D15G15U15D15H15U15"
210 DRAW"BM63,125;C3;G15F15E15D15G15U15D15H15U15"
220 DRAW"BM138,35;C3;F15G15H15D15F15U15D15E15U15"
230 DRAW"BM153,65;C3;F15G15H15D15F15U15D15E15U15"
240 DRAW"BM168,95;C3;F15G15H15D15F15U15D15E15U15"
250 DRAW"BM183,125;C3;F15G15H15D15F15U15D15E15U15"
260 DRAW"BM123,65;C3;F15G15H15D15F15U15D15E15U15"
270 DRAW"BM108,95;C3;F15G15H15D15F15U15D15E15U15"
280 DRAW"BM93,125;C3;F15G15H15D15F15U15D15E15U15"
290 DRAW"BM138,95;C3;F15G15H15D15F15U15D15E15U15"
300 DRAW"BM153,125;C3;F15G15H15D15F15U15D15E15U15"
310 DRAW"BM48,155;C3;G15E15F15E15F15E15F15E15F15E15F15
E15F15G15H15G15H15G15H15G15H15G15H15G15H15"
320 DRAW"BM123,125;C3;F15G15H15D15F15U15D15E15"
330 COLOR2,1
340 CIRCLE(15,14),4
350 LINE(11,20)-(19,20),PSET
360 PAINT(15,14),2,2
370 LINE(10,12)-(20,12),PSET
380 LINE(14,11)-(16,11),PSET
390 PSET(15,10,4)
400 LINE(13,17)-(13,20),PSET
410 LINE(17,17)-(17,20),PSET
420 PSET(15,14,4)
430 PSET(15,20,1)
440 GET(10,10)-(20,20),QQ,G
450 CIRCLE(30,30),5,4:CIRCLE(30,30),2,4
460 GET(25,25)-(35,35),EE,G
470 PAINT(0,0),4,3
480 DRAW"BM5,5;C1;D20U10R10U10D20"
490 DRAW"BM20,5;C2;BM+3,+0;G3D14F3R4E3U14H3L4"
500 DRAW"BM35,5;C1;D20U17E3R4F3D4G3L4H3"
510 DRAW"BM50,5;C2;R10L5D20R5L10"
520 DRAW"BM65,5;C1;R10L5D20"
530 DRAW"BM80,5;C2;BM+2,+0;G2D10F2E2U10H2;BM82,20R1F2D
1G2L1H2U1E2"
540 PMODE3,5:PLLS
550 PCOPY1TO5:PCOPY2TO6:PCOPY3TO7:PCOPY4TO8
560 SCREEN0,1
570 DIMN$(11)
580 N$(0)="C1BM+0,-1FR2EU4HL2GD4"
590 N$(1)="C1BM+1,+0U6G"
600 N$(2)="C1BM+4,+0L4EUR2EUEHL2G"
610 N$(3)="C1BM+0,-1FR2EUHL2R2EUHL2G"
620 N$(4)="C1BM+3,0U6G3R4"
630 N$(5)="C1BM+0,-1FR2EU2HL3U2R4"
640 N$(6)="C1BM+0,-2ER2FDGL2HU4ER2F"
650 N$(7)="C1BM+2,+0U2E2U2L4"
660 N$(8)="C1BM+1,+0R2EUHL2HUER2FDGL2GDF"
670 N$(9)="C1BM+0,-1FR2EU4HL2GDFR3"
680 S$="C1BM+0,-1FR2EH4ER2FBM+4,+5HU4ER2FHL2GD4FR2EBM+
4,+1R2EU4HL2GD4FBM+6,+0U6R3FDGLRF3BM+4,+0R4L4U3R4L4U3R
4"
690 GOSUB1530
700 SC=0:LI=3:LE=250:T=0:A=0:B=0:C=0:E=0:D=0
710 CLS:PRINT@266," R E A D Y ":PLAY"O2V31T5L8GAA£BO3C
O2GAGEO1CO3C"
720 PMODE3,1:SCREEN1,0:X=118:Y=20:TF=0:SX=118:SY=80
730 GET(X,Y)-(X+10,Y+10),WW,G
740 GET(SX,SY)-(SX+10,SY+10),RR,G
750 DRAW"S8"
760 DRAW"BM180,20"+S$
770 QQ=JOYSTK(0):WW=JOYSTK(1)
780 PUT(X,Y)-(X+10,Y+10),WW,PSET
790 IFQQ>60THENX=X+15:Y=Y+30:GOTO830
800 IFQQ<3THENX=X-15:Y=Y-30:GOTO830
810 IFWW<3THENX=X+15:Y=Y-30:GOTO830
820 IFWW>60THENX=X-15:Y=Y+30
830 IFPPOINT(X,Y+10)=4THENGOTO1130
840 IFPPOINT(X-1,Y-1)=1THENPAINT(X,Y),3,3:SC=SC+100:TF
=TF+1:C=C+1
850 IFX=SX ANDY=SY THEN1130
860 GET(X,Y)-(X+10,Y+10),WW,G
870 PUT(X,Y)-(X+10,Y+10),QQ,PSET
880 IFLE>0THENFORF=1TO LE:NEXT
890 IFTF=21THEN1440
900 PUT(SX,SY)-(SX+10,SY+10),RR,PSET
910 IFT=0THENSY=SY+30
920 IFSX=X THENR=RND(2) ELSE960
930 IFR=1THENSX=SX+15:IFPPOINT(SX-1,SY-1)=4THENSX=SX-3
0
940 IFR=2THENSX=SX-15:IFPPOINT(SX-1,SY-1)=4THENSX=SX+3
0
950 GOTO980
960 IFX<SX THEN SX=SX-15:IFPPOINT(SX-1,SY-1)=4THEN SX=
SX+30
970 IFX>SX THENSX=SX+15:IFPPOINT(SX-1,SY-1)=4THENSX=SX
-30
980 GET(SX,SY)-(SX+10,SY+10),RR,G
990 PUT(SX,SY)-(SX+10,SY+10),EE,PSET
```

(continued on page 171)

(continued from page 169)

```
1090 COLOR4,1:LINE(180,21)-(256,40),PSET,BF
1100 DRAW"S8"
1110 DRAW"BM180,40"+N$(E)+"BM195,40"+N$(D)+"BM210,40"+
N$(C)+"BM225,40"+N$(B)+"BM240,40"+N$(A)
1120 GOTO770
1130 LI=LI-1
1140 EXEC32500:PLAY"O1T4V31L4GGL7GGL4B-AAGGF£G"
1150 IFLI=0THEN1210
1160 PRINT@266,"LIVES= "LI
1170 T=0
1180 FORF=1TO1000:NEXTF
1190 PMODE3,1:PCLS
1200 PCOPY5TO1:PCOPY6TO2:PCOPY7TO3:PCOPY8TO4:SCREEN1,0
:GOTO720
1210 POKE&HFFD6,0:PLAY"V31O1T2L4GGL8B-AAGGF£G"
1220 CLS0
1230 PRINT@266,"game";"over";
1240 FORF=1TO250
1250 B=0
1260 NEXTF
1270 FORF=1TO10
1280 IFSC>A(F)THENB=F:F=10
1290 NEXTF
1300 IFB=0THEN1350
1310 FORF=10TO B STEP-1:A(F)=A(F-1):A$(F)=A$(F-1):NEXT
F
1320 CLS:A(B)=SC:INPUT"YOU ARE ONE OF THE TOP SCORERS
 PLEASE ENTER YOUR NAME (LESS THAN 10 LETTERS)";B$
1330 IFLEN(B$)>10THEN1320
1340 A$(B)=B$
1350 CLS:PRINT:PRINT"           HOPIT   HALL OF FAME"
1360 PRINT:FORA=1TO10:PRINT"  "A".. "A(A)" ..."A$(A)
1370 NEXTA
1380 PRINT:PRINT" PRESS (SPACEBAR) TO PLAY AGAIN";
1390 SCREEN0,1
1400 FORF=1TO300
1410 AA$=INKEY$:IFAA$=""THENNEXTF:EXEC32000:GOTO1400
1420 IFAA$=CHR$(32)THENCLS:PCOPY5TO1:PCOPY6TO2:PCOPY7T
O3:PCOPY8TO4:GOTO700
1430 GOTO1420
1440 CLS0
1450 PRINT@266,"well";CHR$(128);"done";
1460 PLAY"O2T5CEFL1GP4L4CEFL1GP4L4CEFL2GECEL1DP8L4EEDL
2.CL4CL2EL4GGGL1FL4EFL2GEL4CL8DD+EGL4AL1O3C"
1470 LE=LE-50
1480 IFLI=3THENSC=SC+1000:D=D+1
1490 IFLI<>3THENSC=SC+500:FORF=1TO5:C=C+1:IFC>9THEND=D
+1:C=0 ELSE NEXTF
1500 IFLE=0THENPOKE&HFFD7,0:LE=150
1510 T=0
1520 PCOPY5TO1:PCOPY6TO2:PCOPY7TO3:PCOPY8TO4:GOTO720
1530 CLS:PRINT@266,"INSTRUCTIONS (Y/N)?"
1540 AA$=INKEY$:IFAA$=""THEN1540
1550 IFAA$="N"THEN RETURN
1560 IFAA$<>"Y"THEN1540
1570 CLS:PRINT"YOU ARE THE LONELY HOPIT AT THE TOP OF
THE PYRAMID OF CUBES.HALF WAY DOWN THE PYRAMID STARTS
THE EVIL BOUNCING RED BALL WHICH"
1580 PRINT"MUST BE AVOIDED AT ALL COSTS.THE BALL CAN O
NLY MOVE DOWN THE    SCREEN AND CANNOT BOUNCE UPWARDS.
WHEN THE BALL REACHES THE"
1590 PRINT"BOTTOM IT REAPPEARS AT THE TOP  OF THE PYRA
MID.":PRINT:PRINT" PRESS ANY KEY TO CONTINUE";:EXEC411
94
1600 CLS:PRINT"TO MAKE THINGS HARDER THE BALL  HOMES I
N ON YOU,SO BEWARE!"
1610 PRINT"  EACH TIME YOU JUMP ON A GREEN TOP CUBE IT
 CHANGES TO A BLUE   TOP CUBE AND YOU GAIN 100 POINTS
IF YOU CHANGE ALL THE CUBE ";
1620 PRINT"TOPS BLUE THEN YOU GO ONTO A NEW    FASTER
SHEET AND GAIN A BONUS  TO YOUR SCORE"
1630 PRINT:PRINT" TO CONTROL THE HOPIT YOU USE   THE R
IGHT JOYSTCK.":PRINT:PRINT"PRESS ANY KEY TO CONTINUE":
EXEC41194
1640 CLS:PRINT" IF YOU CHOOSE TO USE THE         JOYSTIC
K THEN USE THE FOLLOWING DIRECTIONS TO MOVE:-"
1650 PRINT:PRINT" UP-LEFT = LEFT":PRINT:PRINT" UP-RIGH
T = UP":PRINT:PRINT" DOWN-LEFT = DOWN":PRINT:PRINT" DO
WN-RIGHT = RIGHT":PRINT:PRINT:PRINT"PRESS ANY KEY TO S
TART":EXEC41194
1660 RETURN
1670 CLS:PRINT"          HOPIT"
1680 DATA2,2,7,2,2,3,7,3,2,4,7,4,2,5,3,5,4,5,5,5,6,5,7
,5,2,6,7,6,2,7,7,7,2,8,7,8
1690 DATA10,3,10,4,10,5,10,6,10,7,11,2,11,8,12,2,12,8,
13,2,13,8,14,8,14,2,15,3,15,4,15,5,15,6,15,7
1700 DATA18,2,19,2,20,2,21,2,22,2,18,3,23,3,18,4,23,4,
18,5,19,5,20,5,21,5,22,5,18,6,18,7,18,8
1710 DATA26,2,27,2,28,2,29,2,30,2,31,2,28,3,29,3,28,4,
29,4,28,5,29,5,28,6,29,6,28,7,29,7,26,8,27,8,28,8,29,8
,30,8,31,8
1720 DATA34,2,35,2,36,2,37,2,38,2,39,2,40,2,41,2,37,3,
38,3,37,4,38,4,37,5,38,5,37,6,38,6,37,7,38,7,37,8,38,8
,999,0
1730 CLS0
1740 READX,Y:IFX=999THEN1760
1750 SET(X+10,Y,5):GOTO1740
1760 DATA27,11,28,11,29,11,30,11,24,12,25,12,26,12,27,
12,28,12,29,12,30,12,31,12,32,12,20,13,21,13,22,13,23,
13,24,13,25,13,26,13,27,13,28,13,29,13,30,13,31,13,32,
13,33,13,34,13,35,13,999,0
1770 READX,Y:IFX=999THEN1790
1780 SET(X,Y,8):GOTO1770
1790 FORF=25TO30:SET(F,14,2):NEXTF
1800 FORF=24TO31:SET(F,15,2):NEXT
1810 FORF=23TO32:SET(F,16,2):NEXT
1820 FORF=22 TO 33:SET(F,17,2):NEXT
1830 FORF=21TO34:SET(F,18,2):NEXT
1840 FORF=17TO38:SET(F,19,2):NEXTF
1850 FORF=20TO35:SET(F,20,2):NEXT
1860 FORF=21TO34:SET(F,21,2):NEXT
1870 FORF=22TO33:SET(F,22,2):NEXT
1880 FORF=23TO32:SET(F,23,2):NEXT
1890 FORF=24TO31:SET(F,24,2):NEXT
1900 FORF=24TO31:SET(F,25,2):NEXT
1910 PRINT@428,CHR$(159);:PRINT@431,CHR$(159);
1920 PRINT@269,CHR$(206);:PRINT@270,CHR$(205);:PRINT@3
01,CHR$(203);:PRINT@302,CHR$(199);
1930 PRINT@333,CHR$(156);:PRINT@334,CHR$(156);
1940 FORF=1TO3:PRINT@457+F,CHR$(223);:NEXT:FORF=1TO3:P
RINT@462+F,CHR$(223);:NEXT
1950 PRINT@457,CHR$(215);:PRINT@466,CHR$(219);
1960 DATA17,20,17,21,17,22,17,23,16,22,18,22,38,15,38,
16,38,17,38,18,37,16,39,16,999,0
1970 READX,Y:IFX=999THEN1990
1980 SET(X,Y,2):GOTO1970
1990 DATA32,40,3,41,32,1,14,4,18,5,23,32,23,1,20,19,15
,14,32,50,56,47,49,49,47,49,57,56,51,999
2000 A=0
2010 READX:IFX=999THEN2030
2020 POKE1504+AA,X:AA=AA+1:GOTO2010
2030 DATABE,04,00,8C,06,00,27,29,A6,00,81,40,25,17,81,
80,25,19,1F,89,C4,F0,84,0F,43,F7,7F,FF,84,0F,BB,7F,FF,
A7,80,20,DE,8B,40,A7,80,20,DB,8B,C0,A7,80,20,D2,39
2040 FORF=1TO50:READZZ$:POKE31999+F,VAL("&H"+ZZ$):NEXT
F
2050 DATABE,06,00,A6,00,43,A7,80,8C,1E,00,26,F6,39
2060 FORF=1TO14:READZZ$:POKE32499+F,VAL("&H"+ZZ$):NEXT
F
2070 RETURN
```

Moon Land

P Ingram,
Stoke-on-Trent,
Staffordshire.

Vic-20

THIS GAME for the unexpanded Vic-20 is based on an arcade game. The object of the game is to land your ship on any of the three red bases, the controls to do this are: Z = Left ahd C = Right.

If you decide that you cannot make a landing you can abort the mission by pressing the space-bar. This will launch your ship back into space but will use more fuel. When all of your fuel is used up you will fall to the surface of the planet. However you can still guide your ship to the landing base.

When you land a ship you are awarded a number of points — the amount depends upon the speed of the game and the amount of fuel left.

If you crash you will lose one of your six lives. A two-part relocatable machine-code routine is used to reprint the background to prevent the ship erasing the stars, part 1 (SYS 673) saves the displayed picture in RAM; part 2 (SYS705) reprints the picture stored in RAM back on to the screen.

The screen shows score; ships and a fuel bar which turns red as the fuel is used.

Lines	
110-430	Main program
600	Crash routine
700	Landed routine
800	Game over
1000	Abort routine
1200	No fuel routine
2000	Instructions, chr + M/C DATA, lower ram top

The program works by looking at each colour location 38400 to 38905. The value Peeked at each location is loaded into the

(continued on next page)

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accumulator, this value is first anded with 15 and then compared with the two chosen colours; if it is one of the two chosen colours then the accumulator is loaded with the opposite colour, the program then jumps back and Pokes the memory location with the new colour.

If it is not one of the chosen colours the program jumps back and Pokes the memory with the old value i.e., no change in colour.

This is repeated until all of the screen has been covered.

If the value Peeked at each location is not anded with 15 the program will not work due to the fact that the character colour is only four bits long but each location peeked is eight bits long.

```
110 GOSUB2000:H=400:W=0:L=5:F=10:N=0
250 A=0:P=INT(RND(TI)*17)+7702:F=10
254 FORG=1TO10:POKE8170+G,37:POKE38890+G,5:NEXT
255 PRINT"■■SCORE:"W;TAB(14)"SHIPS:"L
258 PRINT"■■■■■■■■■■■■■■■■■FUEL E■■■■■■■■■F■"
260 K=PEEK(197):R=INT(RND(TI)*3):F=F-.3
265 POKEP+A,35:POKEP+A+30720,1:POKE36878,10:POKE36877,253
268 M=PEEK(P+A+22)
270 IFK=32ANDP+A<8142THEN1000
280 IFR=0ANDK=64THENA=A+22
290 IFR=1ANDK=64THENA=A+21
300 IFR=2ANDK=64THENA=A+23
310 IFK=33THENA=A+21
311 IFK=34THENA=A+23
350 IFM<>32ANDM<>46THEN600
360 FORDE=1TOH:NEXT:SYS705:IFH>15THENH=H-1
385 IFF<0THEN1200
420 FORG=1TOFSTEP-1:POKE38890+G,2:NEXT:GOTO260
430 IFP+A<8185THEN260
600 IFM=37THEN700
610 POKE36877,200:L=L-1
620 FORS=15TO0STEP-.1:POKE36878,S:NEXT
630 PRINT"■■■■■■■■■■■■CRASHED"
635 FORDE=0TO2000:NEXT:SYS705
640 POKE36877,0:IFL<0THEN800
650 GOTO250
700 POKE36878,15
710 FORJ=0TO2:FORT=200TO220:POKE36876,T:NEXTT,J:POKE36876,0
720 PRINT"■■■■■■■■■■■■■■LANDED":N=N+1
740 W=W+100+INT(5000/H*F)
750 FORDE=0TO2000:NEXT:SYS705:GOTO250
800 FORDE=0TO3000:NEXT
810 PRINT"■■■■■■■GAME OVER":PRINT"■■■YOU SCORED"W
830 PRINT"■■■AND LANDED"N"■":END
1000 POKE36878,15:POKE36877,130
1020 FORS=0TO7:POKEP+A,35:POKEP+A+30720,1:F=F-.2:IFF<0THENPOKE
36877,0:GOTO1200
1030 FORDE=0TO90:NEXT:POKEP+A+22+30720,2
1040 POKEP+A+22,30:FORDE=0TO90:NEXT:POKEP+A+22,39
1050 FORDE=0TO90:NEXT:SYS705
1060 IFP+A-22>7702THENA=A-22
1070 NEXT
1080 POKE36877,0:POKE36878,0:GOTO260
1200 PRINT"■■■■■■NO FUEL"
1210 POKE36878,15
1220 FORU=235TO180STEP-5:POKE36876,U:NEXT
1230 POKE36878,0:POKE36876,0:IFL<0THEN800
1235 GOTO260
2000 PRINT"■■":POKE36879,10
2010 PRINT"■■■■■■■MOON LANDER■■"
2040 PRINT"■■■■Z■ LEFT":PRINT"■■■■C■ RIGHT"
2070 PRINT"■■■■ SPACE ■ TO ABORT"
2080 FORA=0TO511:POKE7168+A,PEEK(32768+A):NEXT
2090 FORA=0TO39:READZ:POKE7448+A,Z:NEXT
2110 PRINT"■":POKE36879,8:POKE36869,255
2130 FORA=0TO30:S=INT(RND(TI)*380)
2140 POKE7702+S,46:POKE38422+S,7:NEXT
2150 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■#■%■##■%■####■%■#######■■"
2160 L=673
2170 READZ:IFZ=-1THEN2210
2180 POKEL,Z:L=L+1:GOTO2170
2200 POKE51,50:POKE52,24:POKE55,50:POKE56,24
2210 SYS673
2220 RETURN
2250 DATA24,36,126,90,126,36,66,231,24,100,131,0,0,0,0,0
2260 DATA255,255,255,255,0,0,0,0
2270 DATA36,36,24,24,0,0,0,0,90,66,36,36,36,24,24,0
2280 DATA162,0,189,22,30,157,136,24,189,242,30,157,100,25
2290 DATA189,22,150,157,64,26,189,242,150,157,28,27
2300 DATA232,224,220,208,227,96
2310 DATA162,0,189,136,24,157,22,30,189,100,25,157,242,30
2320 DATA189,64,26,157,22,150,189,28,27,157,242,150
2330 DATA232,224,220,208,227,96,-1
```

Space hopper

Gavin Day,
Bungay,
Suffolk.

SOME TIME AGO I saw for the first time, the popular arcade game Moon Buggy. I thought it would be good to write a variation of this on my Oric 1.

This game is very simple as only the space bar is used for jumping. You control a space hopper while exploring the moon's surface. The problem is, as you move along, you come across craters which, if you fall down, you die. These must be jumped over. You have to get as far as possible with one life. If you think that's boring then you had better read on.

Every so often a landing pad or Jewel appears on which you can land for bonus points. At the end of the game you will be told your score and whether it is a new high score or not. If it is left like this for long enough, the computer will exit from that part and return to the instructions via a colourful display.

This program includes some machine code which was submitted to the July 1983 edition of *Your Computer* by Myles Dunlop. The machine code scrolls the screen from right to left. I used Pokes for printing the Moon Hopper and Peeks to check if it is going to hit a landing pad or jewel or if it is going to fall down a crater. The machine code is located in high-resolution graphics memory so it would be advisable not to type Hires before saving the game, otherwise it will have to be retyped in. Warning: Take a £ sign for A#.

For those of you who are new to programming, each subroutine is labelled with a Rem.

```
5 REM MOON HOPPER - G.DAY
7 PAPER0:INK7
9 REM M/C COURTESY OF MYLES DUNLOP / JULY YOUR COMPUT
ER
10 A=#9800
20 READB:IFB=999THEN154
30 POKEA,B
40 A=A+1
50 GOTO20
60 DATA#A9,128,#85,128,#A9,187,#85,129
70 DATA#A9,1,#85,130,#A5,128,#85,131
80 DATA#A5,129,#85,132,#A6,130,#A5,131
90 DATA#18,#69,40,#85,131,#A5,132
100 DATA#69,0,#85,132,#CA,#D0,240
110 DATA#A0,3,#B1,131,#88,#91,131,#C8
120 DATA#C8,#C0,39,#D0,245,#A9,32
125 DATA#91,131,#88,#91,131
130 DATA#A6,130,#E8,#E0,28
140 DATA#F0,5,#86,130,#18,#90,198,#60
150 DATA999
154 GOSUB1500'UDG'S
155 GOSUB1000'INSTRUCTION OP.
160 REM INITIALISE
170 SC=0:LP=000:J=000:PC=0:HS=100
180 PRINTCHR$(17)
200 REM MAIN LOOP
201 CLS:PAPER0:INK7
210 POKE775,255
220 A=INT(RND(1)*1)+23
230 REPEAT
235 PC=PC+1
240 PLOT37,A,126:PLOT37,24,126:PLOT37,25,126:PLOT37,2
6,126
250 CALL#9800
260 UNTILPC=37:PC=0
270 X=48888
280 POKEX,97:POKEX+1,98:POKEX+40,99:POKEX+41,100
290 PLOT10,5,"PRESS ANY KEY TO BEGIN"
300 GETZZ$
310 CALL#9800
320 POKEX,97:POKEX+1,98:POKEX+40,99:POKEX+41,100
330 POKEX-1,32:POKEX+39,32
340 A=INT(RND(1)*2)+23
350 PLOT37,A,126:PLOT37,24,126:PLOT37,25,126:PLOT37,2
6,126
360 K$=KEY$
370 IFK$=" "THENGOSUB430
380 IFPEEK(X+80)=32THEN570
401 IFPEEK(X+41)=101THEN610
402 J=J+1
403 IFJ=050THENPLOT36,21,105:PLOT37,21,106:PLOT36,22,
107:PLOT37,22,108:J=0
404 LP=LP+1
405 IFLP=025THENPLOT36,22,101:PLOT37,22,102:LP=0
406 SC=SC+1
429 GOTO310
430 REM JUMP SUBROUTINE
440 FORN=1TO4
450 POKEX,97:POKEX+1,98:POKEX+40,99:POKEX+41,100
451 A=RND(1)*2+23
452 PLOT37,A,126:PLOT37,24,126:PLOT37,25,126:PLOT37,2
6,126
460 CALL#9800
470 X=X-40
480 POKEX+80,32:POKEX+81,32:POKEX-1,32:POKEX+39,32:PO
KEX+79,32
```

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```
 490 NEXTN
 500 FORN=1TO4
 510 POKEX,97:POKEX+1,98:POKEX+40,99:POKEX+41,100
 511 A=RND(1)*2+23
 512 PLOT37,A,126:PLOT37,24,126:PLOT37,25,126:PLOT37,2
6,126
 520 CALL#9800
 530 X=X+40
 540 POKEX-40,32:POKEX-39,32:POKEX-1,32:POKEX+39,32:PO
KEX-41,32
 545 IFPEEK(X+80)=101ORPEEK(X+81)=101ORPEEK(X+80)=102T
HENGOSUB610
 546 IFPEEK(X+80)=107ORPEEK(X+80)=108ORPEEK(X+81)=107T
HENGOSUB680
 550 NEXT
 560 RETURN
 570 REM CRASH SUBROUTINE
 580 POKEX,32:POKEX+1,32:POKEX+40,103:POKEX+41,104
 590 FORN=12TO1STEP-1:MUSIC1,3,N,0:PLAY1,0,1,5000:NEXT
 600 GOTO720
 610 REM LAND ON PAD SUBROUTINE
 620 PRINT:PRINT:PRINT:PRINTSPC(10)CHR$(142)"WELL DONE
 !!!!!"
 630 PRINTSPC(10)CHR$(142)"WELL DONE !!!!!"
 640 FORN=1TO8:PING:WAIT4:NEXTN
 650 PRINT:PRINT:PRINT:PRINT:PRINT"                500
  BONUS"
 655 WAIT50
 660 FORM=1TO13:FORN=1TO37:PLOTN,M,32:NEXT:NEXT
 665 SC=SC+500
 666 PRINT"        PRESS ANY KEY TO CONTINUE"
 667 GETZZ$
 668 FORN=1TO3:GOTO450
 675 REM LAND ON JEWEL SUBROUTINE
 680 PRINT:PRINT:PRINT:PRINTSPC(10)CHR$(138)"1000"
 690 PRINTSPC(10)CHR$(138)"1000"
 700 FORN=1TO6:MUSIC1,N,7,10:WAIT2:NEXT:PING
 704 SC=SC+1000
 705 X=X+40
 710 RETURN
 720 FORN=1TO6:INK0:PAPER7:INK7:PAPER0:NEXT
 730 CLS
 740 PRINT:PRINT:PRINT:PRINT:PRINT:PRINTSPC(9)"YOUR SC
ORE IS ";SC
 750 IFSC>=HSTHENPLOT10,15,"A NEW HIGH SCORE":HS=SC
 770 PLOT5,23,"PRESS SPACE FOR ANOTHER GAME"
 780 PLOT6,24,"PRESS 'I' FOR INSTRUCTIONS"
 788 DOKE#276,65535
 789 REPEAT
 790 ZZ$=KEY$
 800 IFZZ$=" "THENRUN
 810 IFZZ$="I"THEN1070
 820 UNTIL DEEK(#276)=65035
 821 GOSUB2000'DISPLAY
 1000 REM INSTRUCTION OPTION
 1010 CLS:PRINT"          m n n o  p n q q r s"
 1020 PRINT:PRINT:PRINT:PRINT:PRINT"DO YOU REQUIRE INS
TRUCTIONS (Y/N) ?"
 1030 INPUTI$
 1040 IFI$="N"THEN160
 1050 IFI$="Y"THEN1070
 1060 GOTO1030
 1070 CLS:PRINT"          m n n o  p n q q r s"
 1080 PRINT:PRINT:PRINT"     YOU PATROL A MOON HOPPER
AND "
 1090 PRINT"HAVE TO HOP OVER THE MOONSCAPE "
 1100 PRINT"AVOIDING THE HOLES AND CRATERS USING"
 1110 PRINT"THE SPACE BAR TO JUMP.EVERY SO OFTEN"
 1120 PRINT"A LANDING PAD OR A JEWEL WILL APPEAR"
 1130 PRINT"ON WHICH YOU CAN LAND TO GAIN EXTRA"
 1140 PRINT"POINTS."
 1150 PRINT:PRINT:PRINT:PRINT"    ab"
 1160 PRINT"    cd   =    MOON HOPPER (YOU)
 1170 PRINT:PRINT"    ij"
 1180 PRINT"    kl   =   JEWEL"
 1190 PRINT:PRINT:PRINT"    ef   =   LANDING PAD"
 1200 PLOT5,26,"PRESS ANY KEY TO START"
 1210 GETZZ$:GOTO160
 1500 REM USER DEFINED GRAPHICS
 1510 FORY=1TO19
 1520 READDTA:FORI=DTATODTA+7
 1530 READF:POKEI,F
 1540 NEXTI:NEXTY
 1550 DATA46856,16,8,4,3,7,9,19,63
 1560 DATA46864,2,4,8,48,56,36,50,63
 1570 DATA46872,54,31,13,7,9,16,16,56
 1580 DATA46880,27,62,44,56,36,2,2,7
 1590 DATA46888,0,63,10,12,16,31,40,48
 1600 DATA46896,0,63,20,12,2,62,5,3
 1610 DATA46904,32,25,15,12,25,31,54,26
 1620 DATA46912,6,40,48,48,48,8,42,12
 1630 DATA46920,0,0,0,1,3,6,13,27
 1640 DATA46928,0,0,0,32,48,56,60,62
 1650 DATA46936,55,23,31,15,15,7,3,1
 1660 DATA46944,63,62,62,60,60,56,48,32
 1670 DATA46952,18,63,63,63,63,51,51,18
 1680 DATA46960,12,30,63,51,51,63,30,12
 1690 DATA46968,18,59,63,63,63,63,55,18
 1700 DATA46976,18,51,51,63,63,51,51,18
 1710 DATA46984,30,63,59,63,62,56,56,16
 1720 DATA46992,31,62,48,62,62,48,62,31
 1730 DATA47000,30,63,59,63,60,62,55,19
 1740 RETURN
 2000 CLS:Q=1:PRINT
 2001 REPEAT
 2010 A=INT(RND(1)*7)+128
 2020 PRINTCHR$(142)CHR$(A)"        m n n o  p n q q r
s"
 2030 PRINTCHR$(142)CHR$(A)"        m n n o  p n q q r
s"
 2035 Q=Q+1
 2036 PRINT:PRINT
 2037 MUSIC1,5,Q,8
 2040 UNTILQ=6
 2045 WAIT20
 2050 PING
 2060 WAIT100:GOTO1070
```

Black Adder

BBC

ELECTRON

Nigel Gray,
Bolton,
Lancashire.

AT THE MENTION of machine code, most people scream and try to forget they had ever heard of it. One of the most attractive features of the Acorn Electron is its built-in assembler, which makes learning machine code so much easier for this type of person. For the experienced programmer, it makes the debugging process so much easier and quicker.

The Black Adder is a game written for the Electron in assembly language, though it will run on a BBC Model B with MOS 1.2. After assembling the code, the program asks you if you require instructions. On hitting Y it will tell you that you play a snake — a very hungry snake — who is trying to eat all the strawberries as they appear. Eating a strawberry causes the snake to grow one character bigger; then another strawberry will appear for the snake to eat.

However, there are quite a few snags. These are not ordinary strawberries, but mutant ones. After a certain time, they mutate into an alien fruit, lethal to your snake. What is more, even if the snake manages to eat the strawberry in time, the area around it is still contaminated, causing a mutant fruit to grow after the original time limit has elapsed.

You can probably see that as the game goes on, and your snake gets longer and longer, and the screen begins to fill with poison fruit, it becomes increasingly difficult, until eventually it is downright impossible! To make it even worse, the snake also dies if it crashes into the wall or tries to eat itself.

To control the snake, use keys A — up, Z — down, N — left, M — right. To run the program, simply enter it in, and type run, whereupon the machine code will be assembled. Pressing a key will ask you if you want instructions and — why not type it in and see? Or if you find the listing too daunting to type, a cassette version is available from me at the address below. If you require a cassette, please send £3.50 including postage and packing. Nigel Gray, 53 Buttermere Road, Farnworth, Bolton, BL4 0RJ, Lancs. In the listing please read a hash sign wherever there is a £.

```
10DIMQ%1000
20FORI%=0TO3STEP3
30P%=Q%
40[OPTI%
50.HX EQUB 10
60.HY EQUB 15
70.TX EQUB 12
80.TY EQUB 15
90.Count EQUB 128
100.TempX EQUB0
110.TempY EQUB 0
120.TempA EQUB 0
130.Len EQUB 3
140.Dir EQUB 0
150.X EQUB RND(38)
160.Y EQUB RND(24)
170.Plot PHA
180LDA#31
190JSR&FFEE
200TXA
210JSR&FFEE
220TYA
230JSR&FFEE
240PLA
250JSR&FFEE
260RTS
270.Read LDA#31
280JSR&FFEE
290TXA
300JSR&FFEE
310TYA
320JSR&FFEE
330LDA#135
340JSR&FFF4
350RTS
360.Dsnake LDX HX
370LDY HY
380LDA#224
390JSR Plot:INX
400JSR Plot:INX
410JSR Plot
420RTS
430.Dtarg LDX X
440LDY Y
450LDA#225
460JSR Plot
470RTS
480.Snake LDX Dir
490CPX#0
500BEQ Left
510CPX#1
520BEQ Right
530CPX#2
540BEQ Up
550CPX#3
560BEQ Down
570RTS
580.Left JSR Testch
590LDA#32
600LDX TX
610LDY TY
620JSR Plot
630LDX HX
640LDY HY
650LDA#224
660DEX
670STX HX
680JSR Plot
690JSR Edge
700JSR Tail
710RTS
720.Right JSR Testch
730LDA#32
740LDX TX
750LDY TY
760JSR Plot
770LDX HX
780LDY HY
790 LDA#224
800INX
```

```
810STX HX
820JSR Plot
830JSR Edge
840JSR Tail
850RTS
860.Up JSR Testch
870LDA#32
880 LDX TX
890 LDY TY
900JSR Plot
910LDX HX
920LDY HY
930LDA#224
940 DEY
950STY HY
960JSR Plot
970JSR Edge
980JSR Tail
990RTS
1000.Down JSR Testch
1010LDA#32
1020LDX TX
1030LDY TY
1040JSR Plot
1050LDX HX
1060LDY HY
1070LDA#224
1080INY
1090STY HY
1100JSR Plot
1110JSR Edge
1120JSR Tail
1130RTS
1140.Testch LDX Dir
1150CPX#0
1160BEQ Oleft
1170CPX#1
1180BEQ Oright
1190CPX#3
1200BEQ Odown
1210CPX#2
1220BEQ Oup
1230JMP TestX
1240.Ret LDX Dir
1250CPX#0
1260BEQ Chleft
1270CPX#1
1280BEQ Chright
1290CPX#2
1300BEQ Chup
1310CPX#3
1320BEQ Chdown
1330RTS
1340.Oleft LDX HX
1350LDY HY
1360DEX
1370.ReadO STX TempX
1380STY TempY
1390JSR Read
1400CPX#129
1410BEQ Increase
1420JMP TestX
1430.Increase LDX TempX
1440LDY TempY
1450LDA#224
1460JSR Plot
1470STX HX
1480STY HY
1490INC Len
1500RTS
1510.Oright LDX HX
1520LDY HY
1530INX
1540 JMP ReadO
1550.Oup LDX HX
1560LDY HY
1570DEY
1580JMP ReadO
1590 .Odown LDX HX
1600LDY HY
1610INY
1620JMP ReadO
1630.Chleft LDX HX
1640LDY HY
1650DEX
1660 .Readch STX TempX
1670STY TempY
1680JSR Read
1690CPX#128
1700BEQ Dead2
1710RTS
1720.Dead2 JMP Finish
1730.Chright LDX HX
1740LDY HY
1750INX
1760JMP Readch
1770.Chup LDX HX
1780LDY HY
1790DEY
1800JMP Readch
1810.Chdown LDX HX
1820LDY HY
1830INY
1840JMP Readch
1850.TestX LDA Dir
1860CMP#0
1870BEQ Xleft
1880CMP#1
1890BEQ Xright
1900CMP#2
1910BEQ Xup
1920CMP#3
1930BEQ Xdown
1940JMP Ret
1950.Xleft LDX HX
1960LDY HY
1970DEX
1980.ReadX STX TempX
1990STY TempY
2000JSR Read
2010CPX#130
2020BEQ Dead1
2030 JMP Ret
2040.Dead1 JMP Finish
2050.Xright LDX HX
2060LDY HY
2070INX
2080JMP ReadX
2090.Xup LDX HX
2100LDY HY
2110DEY
2120JMP ReadX
2130.Xdown LDX HX
2140LDY HY
2150INY
2160JMP ReadX
2170.Edge CPX#0
2180BEQ Dead3
2190CPX#39
2200BEQ Dead3
2210CPY#3
2220BEQ Dead3
2230CPY#29
2240BEQ Dead3
2250RTS
2260.Dead3 JMP Finish
2270.Tail LDX TX
2280LDY TY
2290DEY
2300STX TempX
2310STY TempY
2320JSR Read
2330JSR Jump
2340LDX TX
2350LDY TY
2360INY
2370STX TempX
2380STY TempY
2390JSR Read
2400JSR Jump
2410LDX TX
2420LDY TY
2430DEX
2440STX TempX
2450STY TempY
2460JSR Read
2470JSR Jump
2480LDX TX
2490LDY TY
2500INX
2510STX TempX
2520STY TempY
2530JSR Read
2540JSR Jump
2550RTS
2560.Jump CPX#128
2570BEQ Testn
2580RTS
2590 .Testn LDX TempX
2600LDY TempY
2610CPX HX:BEQ TestY
2620CPY HY:BEQ Testx
2630.Reta DEY
2640JSR Read
2650STX&70
2660LDX TempX
2670LDY TempY
2680INY
2690JSR Read
2700CPX#128
2710BEQ Comp1
2720.Testleft LDX TempX
2730LDY TempY
2740DEX
2750JSR Read
2760STX&70
2770LDX TempX
2780LDY TempY
2790INX
2800JSR Read
2810CPX#128
2820BEQ Comp2
2830JMP Newtail
2840.Comp1 CPX&70
2850BNE Testleft
2860RTS
2870.Comp2 CPX&70
2880BNE Newtail
2890RTS
2900.TestY CPY HY:BNE Reta:RTS
2910.Testx CPX HX:BNE Reta:RTS
2920.Newtail LDX TempX
2930LDY TempY
2940STX TX
2950STY TY
2960PLA:PLA
2970RTS
2980.Finish LDA#1:STA&71:PLA:PLA:RTS
2990.Counter DEC Count:BEQ Change:RTS
3000.Change LDX X:LDY Y:JSR Read:CPX#128:BEQ End:LDA#
226:LDX X:LDY Y:JSR Plot:.End RTS:]
3010NEXT
3020A=GET
3030MODE4
3040PRINT'''"Do you want instructions?(Y/N)"
3050A$=GET$:IFA$="Y"THENPROCINSTRUCT
3060PROCSETUP
3070PROCDEFINE
3080CLS:COLOUR129
3090PRINTTAB(0,3);"
     ";TAB(0,29);"
   "
3100FORI=3TO29:PRINTTAB(0,I);CHR$32;TAB(39,I);CHR$32:
NEXT
3110COLOUR128:COLOUR1
3120CALL Dsnake
3130CALL Dtarg
3140CALL Snake
3150CALL Counter
3160IF?&71=1THENGOTO3310
3170IFINKEY(-66)THEN?Dir=2
3180IFINKEY(-98)THEN?Dir=3
3190IFINKEY(-86)THEN?Dir=0
3200IFINKEY(-102)THEN?Dir=1
3210FORN=0TO50:NEXT
3220IF ?Count=0 THEN PROCNEW
3230IF?Count=128THENGOTO3130
3240GOTO3140
3250DEFPROCNEW
3260SOUND1,1,100,5
3270?X=RND(38):?Y=RND(24)+4
3280X%=?X:Y%=?Y:IF (USR(Read)AND&FF00)DIV&100=128 THE
N GOTO 3270
3290?Count=128
3300ENDPROC
3310PRINTTAB(1,4);"You are dead"'" You grew to a leng
th of "?Len
3320SOUND1,1,0,10
3330PRINT''" Do you want another game(Y/N)"
3340*FX15,1
3350A$=GET$
3360IF A$="Y"THENGOTO3030
3370END
3380DEFPROCDEFINE
3390VDU19,0,3,0,0,0:VDU19,1,1,0,0,0
3400VDU23;8202;0;0;0;
3410VDU23,224,231,231,231,24,24,231,231,231
3420VDU23,225,226,54,127,127,127,62,28,8,0
3430VDU23,226,8,28,62,127,62,28,8,0
3440ENDPROC
3450DEFPROCSETUP
3460?HX=10:?HY=15
3470?TX=12:?TY=15
3480?Count=128
3490?Len=3
3500?Dir=0
3510?X=RND(38):?Y=RND(24)+4:IF (USR(Read)AND&FF00)DIV
&100=128THENGOTO3510
3520?&71=0
3530ENDPROC
3540DEFPROCINSTRUCT
3550CLS
3560PRINT''''TAB(10)"*******SNAKE*******"
3570PRINT'"You are a snake in a garden."
3580PRINT'"You must eat the strawberries, "CHR$225" w
hich  eventually mutate into poisonous fruit, "CHR$226
" which you must not eat"
3590PRINT"You also die if you crash into the wall or
eat yourself"
3600PRINT'"A-UP    N-LEFT"'"Z-DOWN  M-RIGHT"
3610PRINT'"Press any key to continue"
3620A=GET
3630ENDPROC
```

The Sirus Grid

Andrew Farlow,
Widley,
Portsmouth.

VIC-20

THIS GAME FOR the Vic-20 requires 3K expansion and a joystick. The instructions are as follows:

A choice of skill is available before you start.

You have been sent to the grid, where you will be required to collect the light discs, which will be in each of the four corners of the grid — if you have chosen an easier level of skill there will only be light discs in the top corners of the grid.

Growing horizontally from the middle left and right of the grid and vertically from the top of the grid, there is a living wall. The horizontal walls will grow towards the centre of the grid; you will lose a life if either of the horizontal walls reach the centre of the grid.

If the vertical wall reaches the white cross lower down the grid you will also lose a life — the white cross will be placed according to the current skill level. The higher the skill level

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the higher the white cross, and so the less time you have to collect the discs.

Another difficulty is a laser, which will move from left to right along the bottom of the grid. This will randomly fire a laser bolt which is lethal.

When you have collected all the discs you must go down to the bottom of the grid, where this is a door — marked D — there you must wait until you are let in. You will then go onto the next grid skill level.

```
1 POKE36879,93:POKE36878,15
3 PRINT"J"
5 POKE37879,255
7 POKE36869,255
10 FORB=7424TO7432:POKEB,0:NEXT
20 UD=7168
25 FORN=210TO250:FORE=NTON+4:POKE36876,E:NEXT
30 FORT=0TO5:NEXT
40 READDD
45 POKEUD,DD
50 UD=UD+1
55 NEXT:POKE36876,0
100 DATA0,24,60,126,66,126,126,60
110 DATA126,126,126,126,36,100,4,6
120 DATA126,126,126,126,36,36,38,96
130 DATA0,56,56,16,124,16,40,68
140 DATA0,0,255,129,165,149,149,165,129
200 POKE36878,15
210 PRINT"J";
230 PRINT"    WHICH GRID DO YOU"
240 PRINT"  WISH TO ATTEMPT "
250 PRINT"  THE LOWER THE GRID "
260 PRINT"      THE EASIER !"
270 PRINT" PRESS A KEY FROM(1-9)";
280 GETSR$:IFSR$=""THEN280
310 SR=VAL(SR$):SR$=""
320 POKE36879,172
340 REM   COPYRIGHT     ANDREW FARLOW(C)1983
350 PRINT"THE SIRUS GRID"
360 PRINT"       LEVEL";SR
370 CS=0:SI=SR*10/2:LI=3:SM=8166:LC=1
380 YD=8130-SR*22
390 LI$="CCC"
400 GOSUB1220
410 PRINT"GRID";SR
420 PRINT"LIVES";LI$
430 POKE36874,0
440 POKE8174,4
450 IFSR<2THENPOKE7770,209:POKE7787,210
460 IFSR>1THENPOKE7770,209:POKE7787,210:POKE8122,211
470 IFSR>2THENPOKE7770,209:POKE7787,210:POKE8122,211:POKE8138,193
480 X1=7900:Y1=7756:X2=7921
490 SH=7910:AV=1
500 POKEYD+30720,1
510 GOSUB710
512 POKESH,0:POKESH+22,LC
515 IFLC=1THENLC=2:GOTO520
517 IFLC=2THENLC=1
520 PRINT"LIVES";LI$
530 POKE8174,4
540 PRINT"SCORE";SC
550 SM=SM+1:POKESM,230:POKESM-1,219
560 IFSM>8182THENPOKESM,219:SM=8167
570 IFL=17THENL=0:GOSUB890
580 IFPEEK(7770)<>209ANDPEEK(7787)<>210THENCJ=17
590 IFCJ=17ANDPEEK(8122)<>211ANDPEEK(8139)<>193THENCJ=0:POKE36876,
    200:D=D+0.5:CD =17
600 IFD=INT(D)THENPOKE36876,0
620 IFPEEK(36876)=200ANDPEEK(SH+22)=4THEN1070
630 IFX1<7900THENPOKEX1,219:X1=X1+1
640 IFX2>7922THENPOKEX2,219:X2=X2-1
650 IFY1<7734THENPOKEY1,219:Y1=Y1+22
660 POKEINT(X1),230:POKEINT(Y1),230:POKEINT(X2),230
670 X1=X1+0.14:X2=X2-0.14:IFAV=INT(AV)THENY1=Y1+22
680 IFX1>7911ORY1>YDORX2<7911THEN1100
690 IFRND(0)<0.2ANDCB<>17ANDSM<>8174THENGOSUB1470
700 AV=AV+0.25:GOTO510
710 POKE37139,0:POKE37154,127:U=PEEK(37137):U0=((UAND4)=0)
720 U1=-((UAND8)=0):U2=((UAND16)=0):U4=((UAND32)=0)
730 W=PEEK(37152):U3=-((WAND128)=0):POKE37154,255
740 IFU0<>0ANDPEEK(SH-22)<>230ANDPEEK(SH-44)=219THENSH=SH-22:
    FI=-22:POKESH+22,219:CF=17
750 IFCF=17THENCF=0:POKESH+44,219
760 IFU1<>0ANDPEEK(SH+66)<>230THENSH=SH+22:FI=22:POKESH-22,219:CF=17
770 IFCF=17THENPOKESH-44,219
780 IFU2<>0ANDPEEK(SH-1)<>230ANDPEEK(SH-2)<>235THENSH=SH-1:CJ=17
790 IFCJ=17THENCJ=0:FI=-1:POKESH+1,219:POKESH+23,219
800 IFU3<>0ANDPEEK(SH+1)<>230ANDPEEK(SH+2)<>243THENSH=SH+1:CJ=17
810 IFCJ=17THENCJ=0:FI=1:POKESH-1,219:POKESH+21,219
820 IFU0<>0ANDU2<>0THENFI=-23
830 IFU0<>0ANDU3<>0THENFI=-21
840 IFU1<>0ANDU2<>0THENFI=21
850 IFU1<>0ANDU3<>0THENFI=23
860 IFU4<>0THENL=17
870 RETURN
890 M=SH
895 FORH=0TO8
900 POKEM,174
910 POKE36877,200-H
920 FORT=0TO10:NEXT
930 IFM=INT(X2)THENX2=X2+1:POKEM,230:GOSUB1360:GOTO1060
940 IFM=INT(X1)THENX1=X1-1:POKEM,230:GOSUB1360:GOTO1060
950 IFM=INT(Y1)THENY1=Y1-22:POKEM,230:GOSUB1360:GOTO1060
960 IFM<7760THENPOKEM,219:GOTO1030
970 POKE36877,200-H
980 POKESH,0:POKESH+22,LC
990 POKEM,219
1000 M=M+FI
1010 IFPEEK(M+1)=235ORPEEK(M-1)=235THEN1030
1020 NEXT:POKEM-FI,219
1030 IFSR<2THENPOKE7770,209:POKE7787,210
1040 IFSR>1THENPOKE7770,209:POKE7770,210:POKE8122,211
1050 IFSR>2THENPOKE7770,209:POKE7787,210:POKE8122,211:POKE8139,193
1060 POKE36877,0:POKE36876,0:RETURN
1070 POKE36876,0:PRINT"WELL DONE
     ADVANCE TO LEVEL";SR+ ;
1080 YD=YD-22:CB=0
1090 PRINT"";:SR=SR+1:SC=SC+500:SI=SR*10/2:GOTO400
1100 LI=LI-1:IFLI=0THEN1370
1110 IFLI=2THENLI$="CC"
1120 IFLI=1THENLI$="C"
1130 PRINT"";
1140 IFLI=1THENPRINT"1 LIFE LEFT":GOTO1160
1150 PRINT"";LI;"LIVES LEFT"
1160 FORSS=1TO5
1170 FORR=200TO180STEP-1:POKE36876,R:NEXT
1180 FORR=180TO200:POKE36876,R:NEXT
1190 NEXT:POKE36876,0
1200 GOSUB1220
1210 GOTO440
1220 FORE=200TO230:FORN=ETOE+5:POKE36876,N:NEXT:NEXT:POKE36876,0
1225 PRINT"";
1230 A$="_____________________"
1240 FORA=0TO20:PRINTA$;:POKE36877,200:NEXT:PRINT"";
1250 POKE8184,192:POKE38904,6:POKE8185,192:POKE38905,6
1260 B$="+++++++++++++++++++++"
1270 FORA=0TO20:PRINTB$;:NEXT
1280 PRINT"";:FORA=0TO21:PRINT"+";:NEXT
1290 POKE8184,219:POKE38904,6:POKE8185,219:POKE38905,6
1300 POKE36877,0:FORT=0TO40:NEXTT:FORE=200TO170STEP-2:POKE36877,E:
     NEXT:POKE36877 ,0
1310 FORE=180TO190:POKE36875,E:NEXT:POKE36875,0
1320 FORP=7680TO8165STEP22:POKEP,235:NEXT
1330 FORP=7701TO8185STEP22:POKEP,243:NEXT
1340 PRINT"GRID";SR
1350 RETURN
1360 POKE36877,0:FORN=190TO200:POKE36876,N:NEXT:SC=SC+SI:RETURN
1370 POKE36869,240:PRINT"  G A M E  O V E R"
1380 PRINT"   YOU SCORED";SC
1390 FORN=230TO180STEP-1:FORG=NTON-4STEP-1:POKE36876,G:NEXT:NEXT
1400 FORN=200TO190STEP-1:POKE36876,N:NEXT
1410 POKE36876,0
1420 PRINT"    PRESS THE FIRE "
1430 PRINT"     BUTTON TO"
1440 PRINT"      PLAY AGAIN"
1450 WAIT37137,32:WAIT37137,32,32
1460 RUN
1470 GOSUB710
1480 POKE36875,140
1490 POKESH,0:POKESH+22,LC
1500 FORKL=SMTOSM-418STEP-22
1510 POKEKL,194
1520 IFPEEK(SH)=194THENPOKE36877,0:GOSUB1580
1530 NEXT
1540 FORKL=SMTOSM-418STEP-22:POKEKL,219
1550 NEXT
1560 POKE36875,0
1570 RETURN
1580 FORT=0TO100:NEXT
1590 POKE36875,0:POKE36877,150
1600 E1=SH-1:E2=SH+1:E3=SH-22:E4=SH+22:E5=SH-23:E6=SH+23
1610 POKEE1,81:POKEE2,124:POKEE3,90:POKEE4,125:POKEE5,78:POKEE6,112
1620 POKEE1,219:POKEE2,219:POKEE3,219:POKEE4,219:POKEE5,219:
     POKEE6,219
1630 E1=E1-1:E2=E2+1:E3=E3-22:E4=E4+22:E5=E5-23:E6=E6+23
1640 IFE3=SH-132THEN1660
1650 GOTO1610
1660 FORE=150TO240:POKE36877,E:NEXT
1670 FORT=0TO200:NEXT
1680 FORE=240TO200STEP-1:POKE36877,E:NEXT
1690 POKE36877,0:GOTO1100
```

Back-up

John Chippendale,
Basingstoke,
Hampshire.

VIC-20

THIS PROGRAM will enable you to make back-up copies of practically all Basic and most machine code programs.

Load the program and when finished it will run itself. To get out of this press Run/Stop, this should cause a sound to be heard. This can be stopped by pressing the Run/Stop and Restore keys. When all is ready the program can be Run and first time round the computer will show:

PRESS PLAY ON TAPE
OK

The computer will not display Searching although it is really. It will also only load the first part of a program if the program is in two or three parts. When it has loaded the first part, another sound will be heard. This means the computer is waiting for the original cassette to be replaced with a blank cassette. After this the screen will show:

PRESS PLAY ON TAPE
OK

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The screen should not change at all. When the cassette is in press Play and Record and then press Return. The sound will then stop and the computer will Save the program that has been loaded. When it has finished the screen will be cleared and Ready appears.

If Run is typed in, the computer will run the program it has just loaded, this is why SYS256 must be used to re-run the program. The display this time will be different and also a beep will not be heard unless Poke 36878,15:SYS256 is entered to re-run it. This time the screen will show:

```
PRESS PLAY ON TAPE
OK
SEARCHING
FOUND abcdef
LOADING
```

When the program has loaded, replace the original cassette again and press Play and Record again not forgetting Return, the screen will then show:

```
SAVING abcdef
```

The screen will go blank when it has finished and to re-run use the instructions as above.

Sometimes on loading a program the screen might be filled/half-filled with random characters. This is nothing to worry about because the program will still work.

Vic Back-up.

```
79 POKE36878,15
80 FORX=0TO87:READY:POKE256+X,Y:NEXT
85 SYS256
90 DATA162,1,160,255,32,186,255,169,
   0,32,189,255,162,255
100 DATA160,255,32,213,255
104 DATA169,200
105 DATA141,12,144
106 DATA32,228,255
107 DATA201,13
108 DATA208,249
109 DATA141,12,144
111 DATA162,70
112 DATA189,65,3
113 DATA157,128,1
114 DATA202
115 DATA16,247
120 DATA173,60,3
121 DATA74
122 DATA168
124 DATA169,1
126 DATA162,1
130 DATA32,186,255
132 DATA162,128
134 DATA160,1
140 DATA169,65
150 DATA32,189,255
160 DATA173,61,3
170 DATA133,0
180 DATA173,62,3
190 DATA133,1
200 DATA169,0
210 DATA174,63,3
220 DATA172,64,3
230 DATA32,216,255
240 DATA0
```

Utilities

T P Love,
Portsmouth,
Hampshire.

DRAGON

THIS PROGRAM provides two utilities to liven the Dragon's text screen; the inversing of any rectangle and the wrap-around of any rectangle. Run the program and press any of the keys to see them in action. To use these utilities in your own programs you need only add lines 10, 20 and the data statements to what you have already. Then if you want to inverse, for example, the box with T.L. corner at 170 and BR corner at 340 type:

```
PRINT@170"";:USR01(340)
```

Using this method you can get all the inverse numerals and punctuation that is unavailable directly via the keyboard.

Dragon utilities.

```
10 CLEAR200,32562:DEFUSR1=&H7F33:DEFUSR2=&H7F37
20 FORI=1TO179:READX$:X=VAL("&H"+X$):T=T+X:POKE32562+I
,X:NEXTI
30 IF T<>20751 THENPRINT"ERROR":END
40 CLS6:PRINT@201,"DEMONSTRATION";:PRINT@236,"PROGRAM"
;:PRINT@76,"TESTING";:PRINT@105,"1..2..3..4..5";
50 IFINKEY$=""THEN50ELSE PRINT@39,"";:I=USR01(152)
60 IFINKEY$=""THEN60ELSE PRINT@202,"";:FORJ=1TO13:PLAY
"P86":I=USR02(246):NEXTJ
70 GOTO50
80 DATA10,8E,0,1,DC,88,FD,7F,E8,7F,7F,EA,BD,8B,2D,C3,4
,1,B3,7F,E8
90 DATA8E,0,1,10,83,0,20,2D,7,83,0,20,30,1,20,F3,F7,7F
,EB,BF,7F
100 DATAEC,10,8C,0,1,26,23,10,BE,7F,E8,A6,A4,88,40,A7,
A0,5A,26,F7
110 DATA8C,0,1,27,6A,1F,20,C3,0,20,B3,7F,EA,1F,2,F6,7F
,EB,30,1F
120 DATA20,E1,10,BE,7F,E8,31,A5,31,3F,8E,7F,EE,F6,7F,E
D,A6,A4,A7
130 DATA80,5A,27,5,31,A8,20,20,F4,BE,7F,EC,F6,7F,EB,5A
,31,3F,A6
140 DATAA0,A7,A4,31,3F,5A,26,F5,8C,0,1,27,12,1F,20,83,
0,21,F3,7F
150 DATAEA,1F,2,F6,7F,EB,30,1F,5A,20,DE,10,BE,7F,E8,8E
,7F,EE,F6
160 DATA7F,ED,A6,80,A7,A4,5A,27,5,31,A8,20,20,F4,FC,7F
,E8,DD,88,39
```

Clock

P Brett,
Pasturefields,
Stafford.

CBM-64

THIS PROGRAM FOR the Commodore 64 displays a clock at the top of the screen while other programs are running. It uses a built-in hardware clock, locked into the mains frequency, which provides BCD outputs.

Line 5 defines a function to convert decimal to BCD — binary coded decimal.

Line 6 disables the restore by pointing the NMI vector at a RTI instruction in the kernal ROM.

Line 10 defines the starting address of the machine code — this can be altered as the program sorts out any relocating.

The program should be saved before running as it news itself on running.

Clock.

```
5 DEF FNA(X)=INT(X/10)*16+(X-INT(X/10)*10)
6 POKE792,193
10 AD=49152
20 FORC=0TO91:READH$
30 L=ASC(LEFT$(H$,1))-48
40 R=ASC(RIGHT$(H$,1))-48
50 POKEAD+C,(L+(L>9)*7)*16+(R+(R>9)*7)
60 NEXT
70 DATAA2,00,AD,0B,DC,29,7F,20,00,00,A2,03,AD,0A,DC,20,00,00,A2,06,AD,09,DC
80 DATA20,00,00,AD,08,DC,A9,BA,8D,02,04,8D,05,04,A9,07,8D,02,D8,8D,05,D8
90 DATA4C,31,EA,48,29,F0,4A,4A,4A,4A,18,69,B0,9D,00,04,68,29,0F,18,69,B0
100 DATA9D,01,04,A9,07,9D,00,D8,9D,01.D8,60
110 DATA78,A9,00,8D,14,03,A9,00,8D,15,03,58,60
120 SU=AD+48:SH=INT(SU/256):SL=SU-SH*256
130 JH=INT(AD/256):JL=AD-JH*256
140 POKEAD+8,SL:POKEAD+9,SH
150 POKEAD+16,SL:POKEAD+17,SH
160 POKEAD+24,SL:POKEAD+25,SH
170 POKEAD+81,JL:POKEAD+86,JH
175 POKE56334,PEEK(56334)OR128
180 SYSAD+79
185 POKE56335,PEEK(56335)AND127
190 INPUT"HOURS";H:POKE56331,FNA(H)
200 INPUT"MINUTES";M:POKE56330,FNA(M)
210 INPUT"SECONDS";S:POKE56329,FNA(S):POKE56328,0
220 NEW
```

ADVENTURE Competition RESULTS

MARCH'S COMPETITION offered adventure addicts the chance to escape from the confines of the text and the TV screen. In conjunction with Melbourne House we are sending eight finalists to Peckforton Castle where they will act out a real adventure.

The problem we set was part of an adventure game that has yet to be played, and there was considerable argument among our panel of experts as to what the solution should be. We finally decided that the best item to drop would be the bread while the most useful object to pick up would be the bunch of keys.

Keep the torch

Clearly you could not afford to drop the torch; adventure locations are often badly lit so some source of light is vital. Water was thought to be more valuable than bread on the grounds that you can survive longer without food than drink. Jabbarl's own suggestion that the bread should be retained for use in laying a trail was dismissed as less relevant.

Since the immediate objective is to open a door the bunch of keys were given preference over the dagger and staff. Choosing between the three characters was, however, more difficult. The consensus of opinion among experienced adventure gamesters was that magicians are rarely trustworthy. Observant readers will have noticed that Chrom has the power to magically change his name — to Chron — in the course of a single article — a piece of sneakiness that does not inspire confidence. Elthin and Jabbarl, by contrast, seem both stout-hearted fellows likely to give their all in a scrap.

Our own preference was for Elthin — his smaller stature makes him more suitable for those twisty little passages commonly found in adventure games. But Jabbarl would undoubedly be useful in battering down doors which the keys failed to open.

In view of how evenly matched these two are we decided not to rule out entries whose choice did not agree with our own. Anyone who selected the right objects was in the running for a place in the final.

The tiebreaker asked competitors to give their reasons for enjoying adventures. A common theme was that adventures provide an escape from the burdens of reality. John Brooman-Wrexham gave the reason: "escapism from the real world and income tax". Marcus Groan, Bristol, made the same point with "one fifth of my dole buys me an escape and a goal".

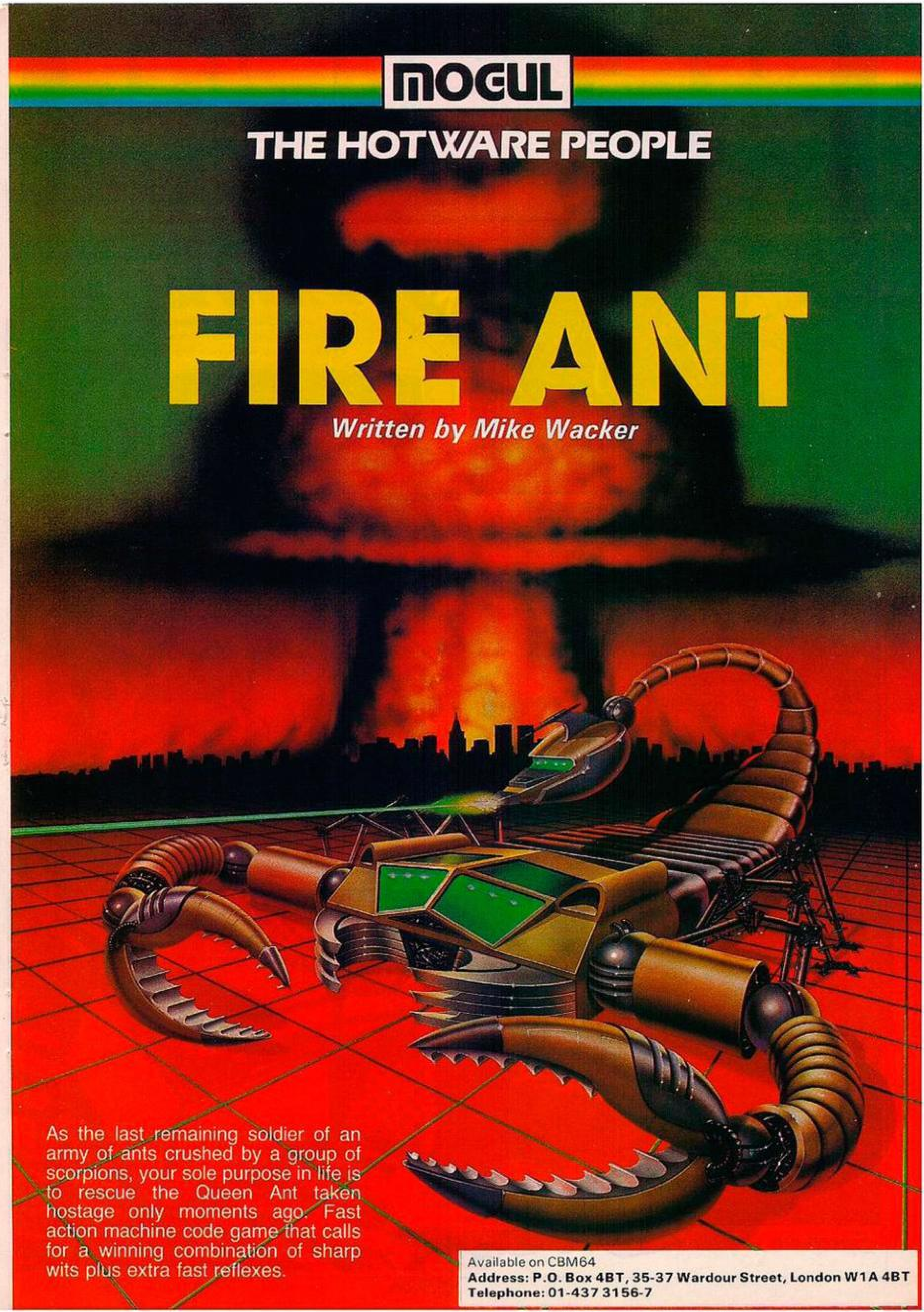
Others simply enjoy the challenge of adventures. Gerry Lovell, Weston-Super-Mare, admitted candidly, "I realise my potential for guile, stealth, imagination, cunning and plain nastiness"; while as Mike Lewis, London, put it, "if you're a thief, magician, or an assasin, there's no fun like monster bashin".

Runners-up prizes

This last entry is to be sung to the tune of the Thompson Local advertisement — if you remember it. Alan Berg, Wardley, was equally tuneful with "to live the impossible dream, to beat the unbeatable foe . . ."

All these gain a visit to Peckforton Castle. The last three places in the final go to Alan Berg, Lancing, for "drowned, tortured, lost, but still at least I'm back in time for tea; so S J Rhodes, Luton, for "intellectual stimulation beats arcade simulation"; and to Carole Holmes, Relford, who summed it up with "enjoyable adventures contain matchless mysterious, mind-boggling locations, and a magnificent climax".

For the runners-up there were ten Melbourne House adventure games. These were won by the following competitors: C Wong, S Olsen, A Lucas, G Edwards, M Sly, K Ross, A Cerezo, N Olner, R Collinson, A Cameron.


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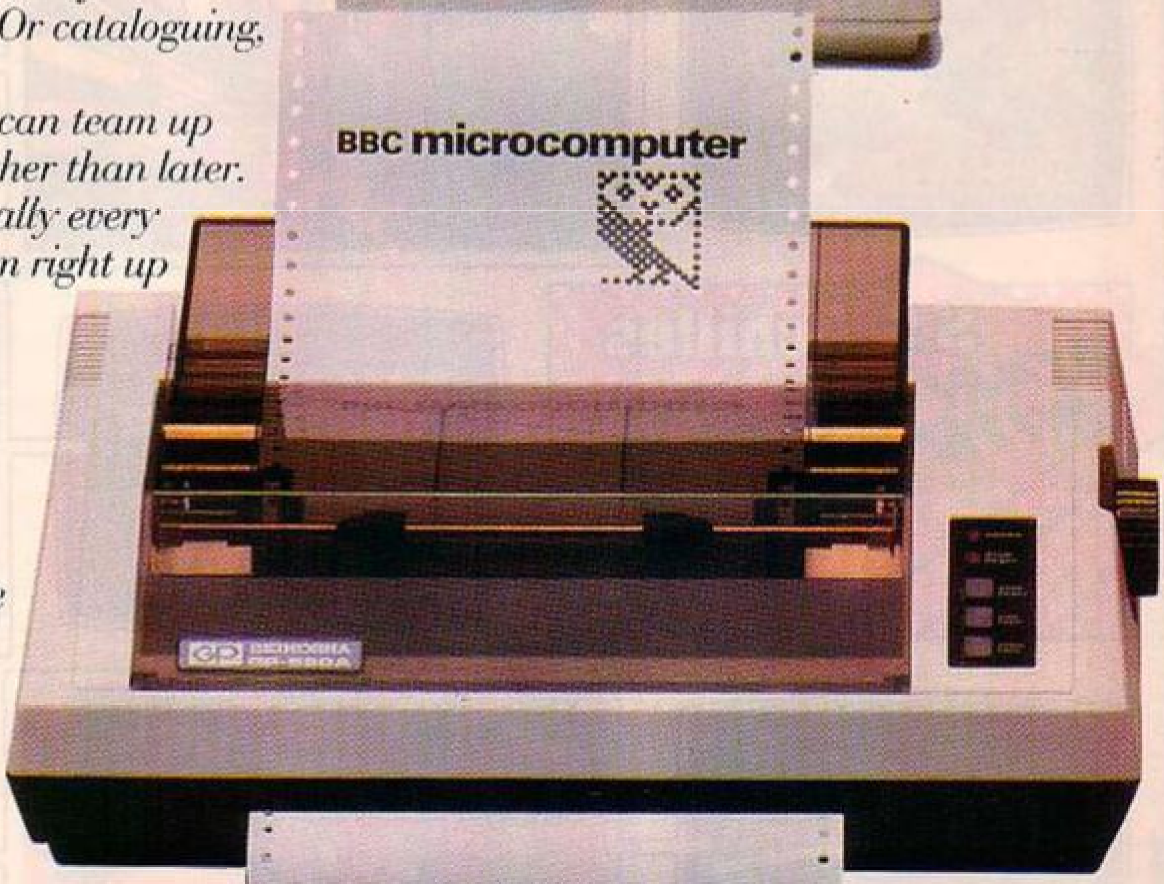


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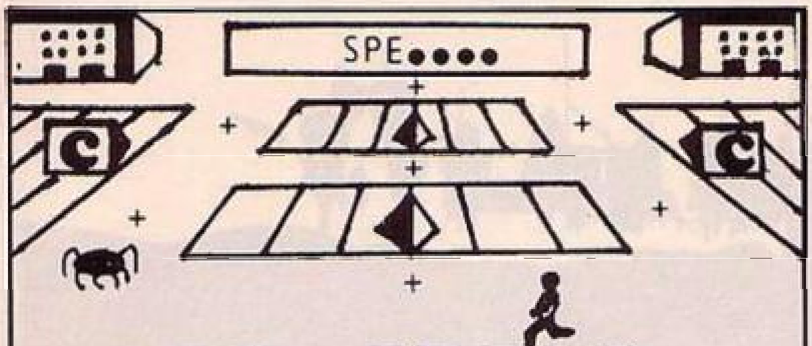
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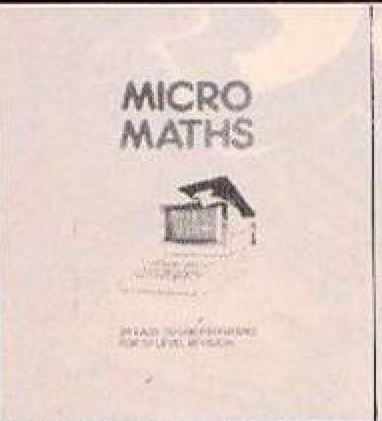
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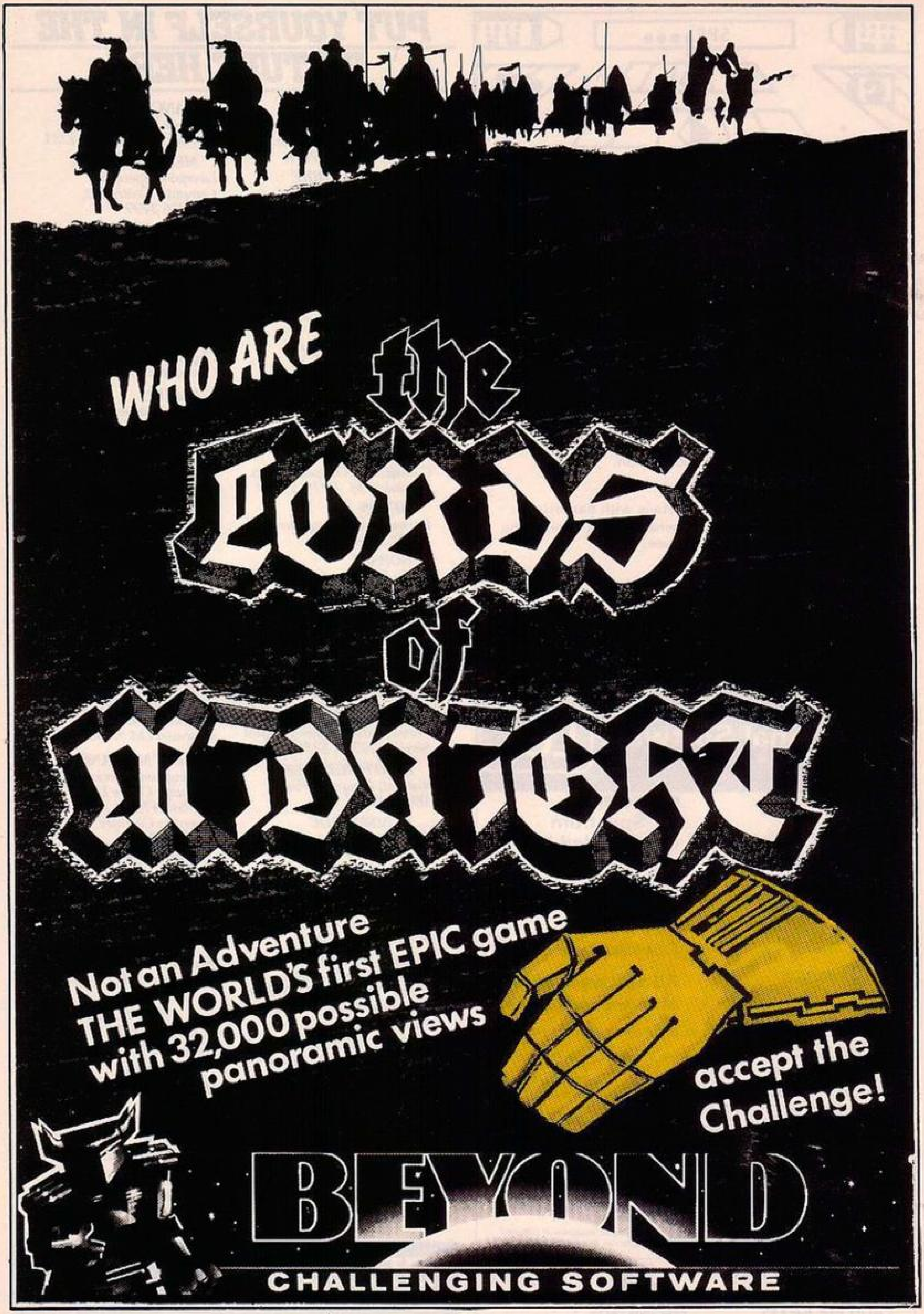
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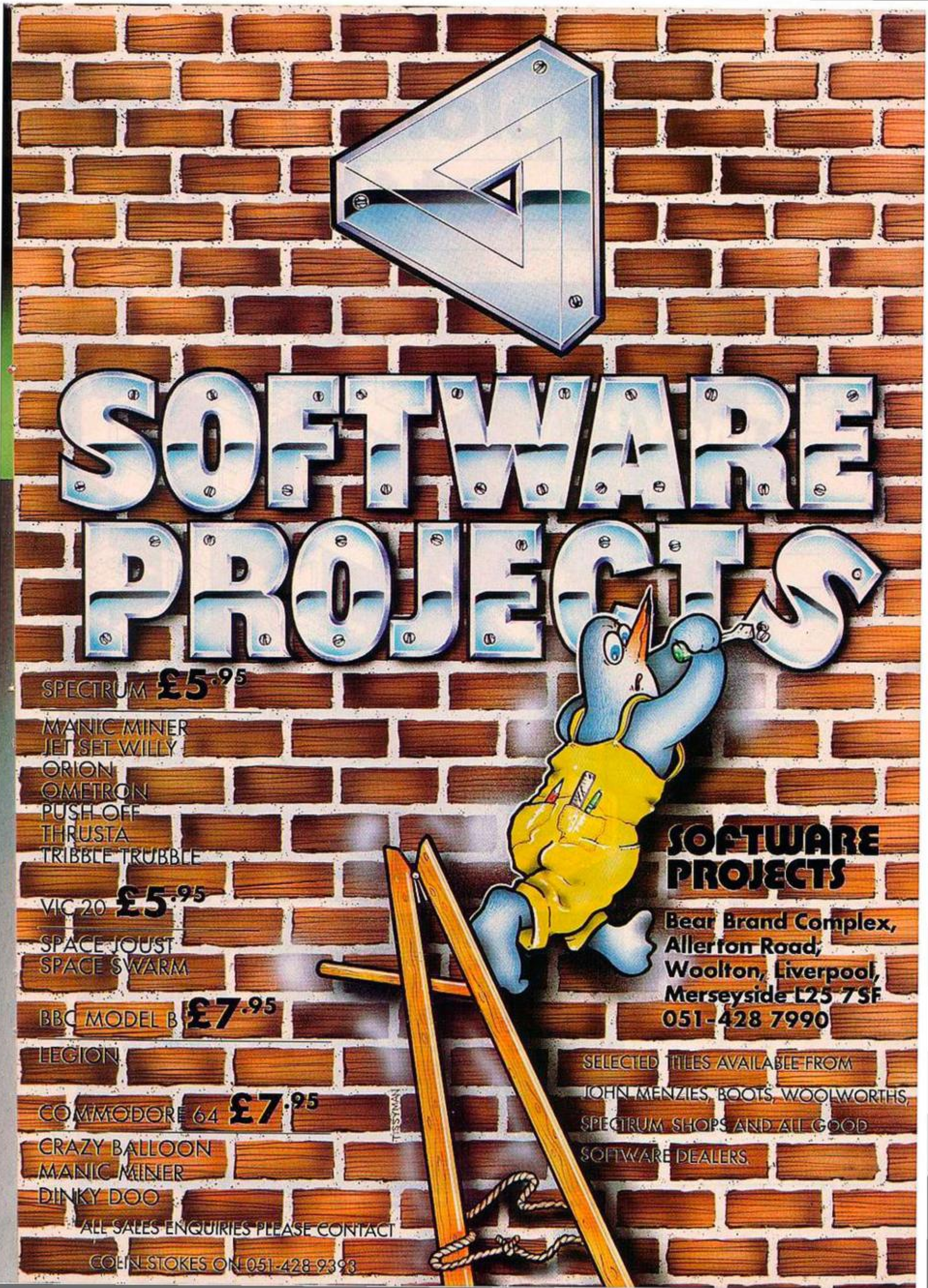
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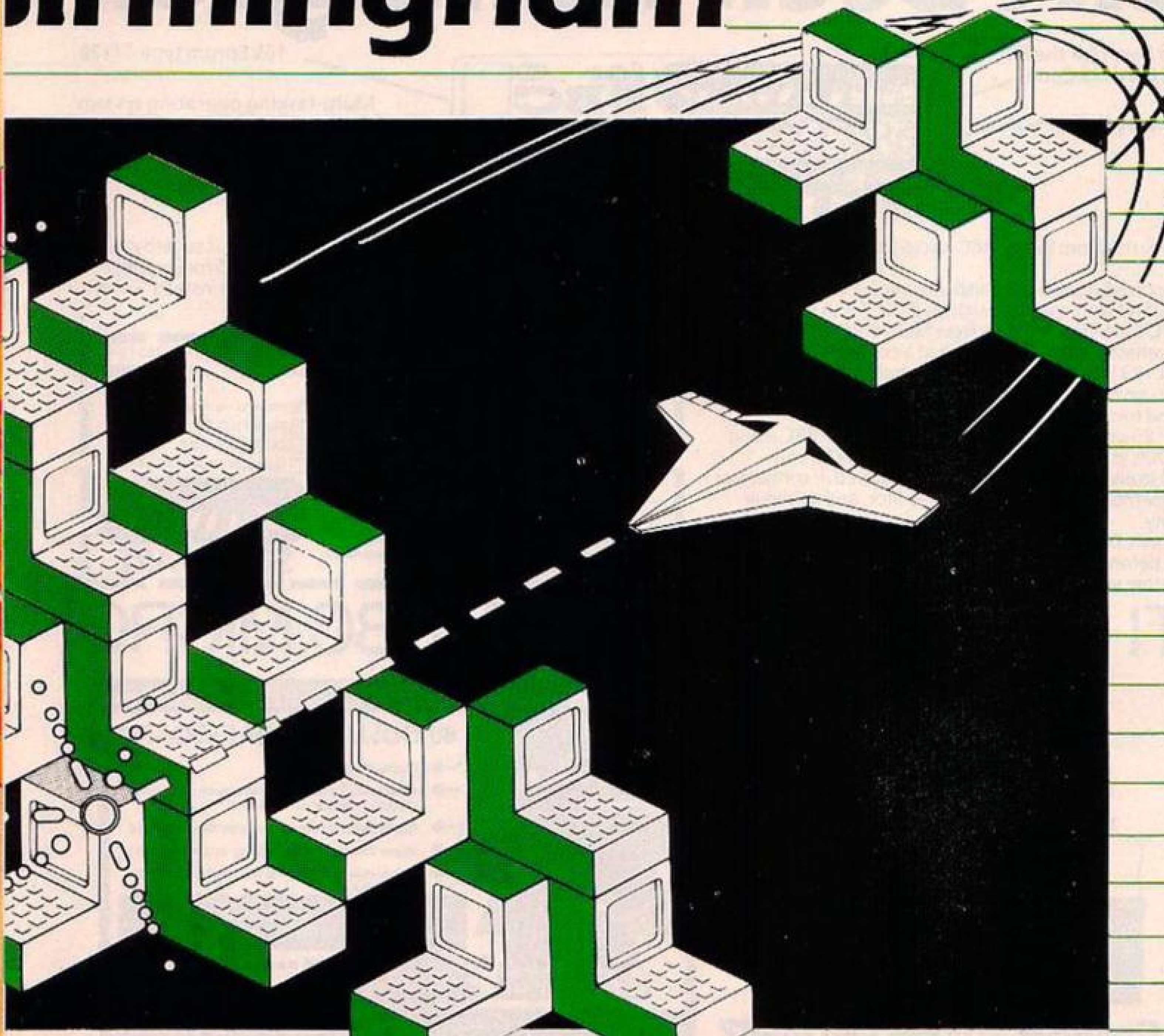
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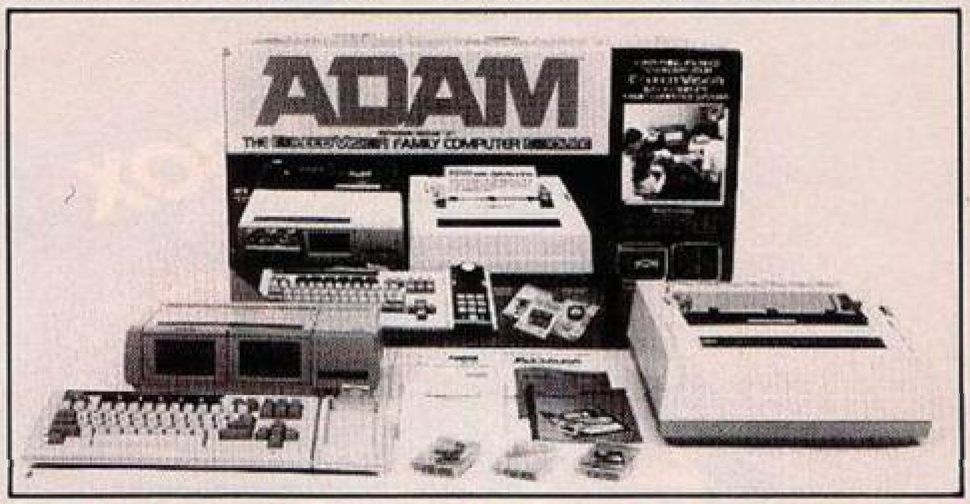
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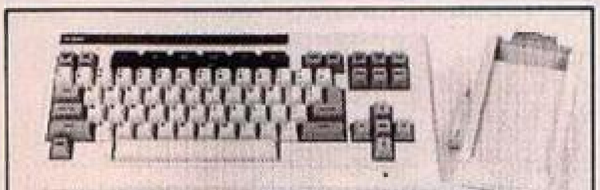
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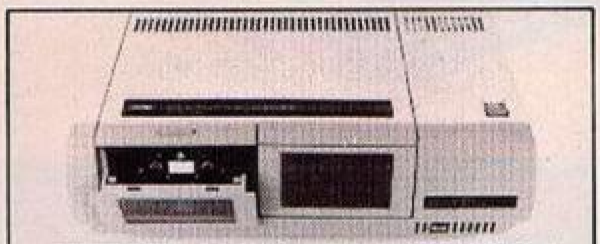
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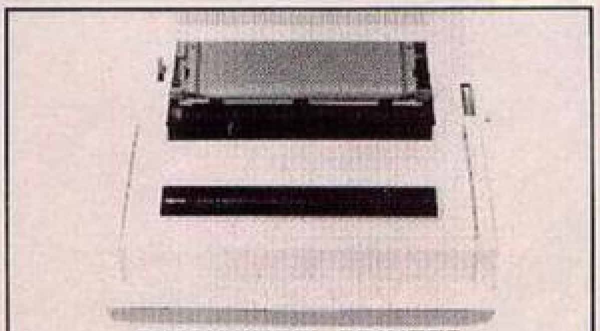
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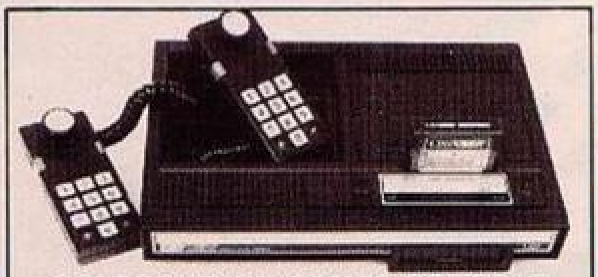
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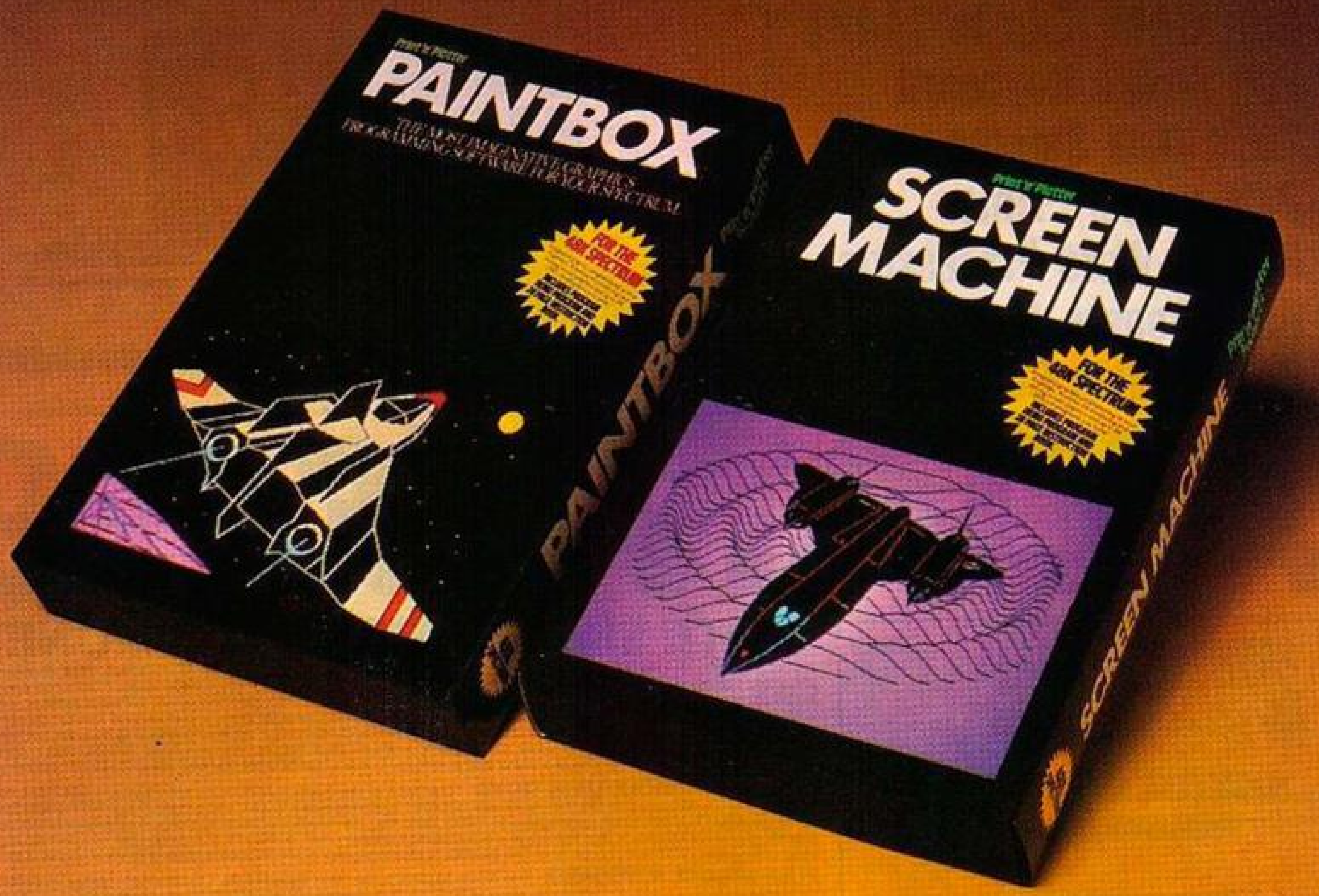
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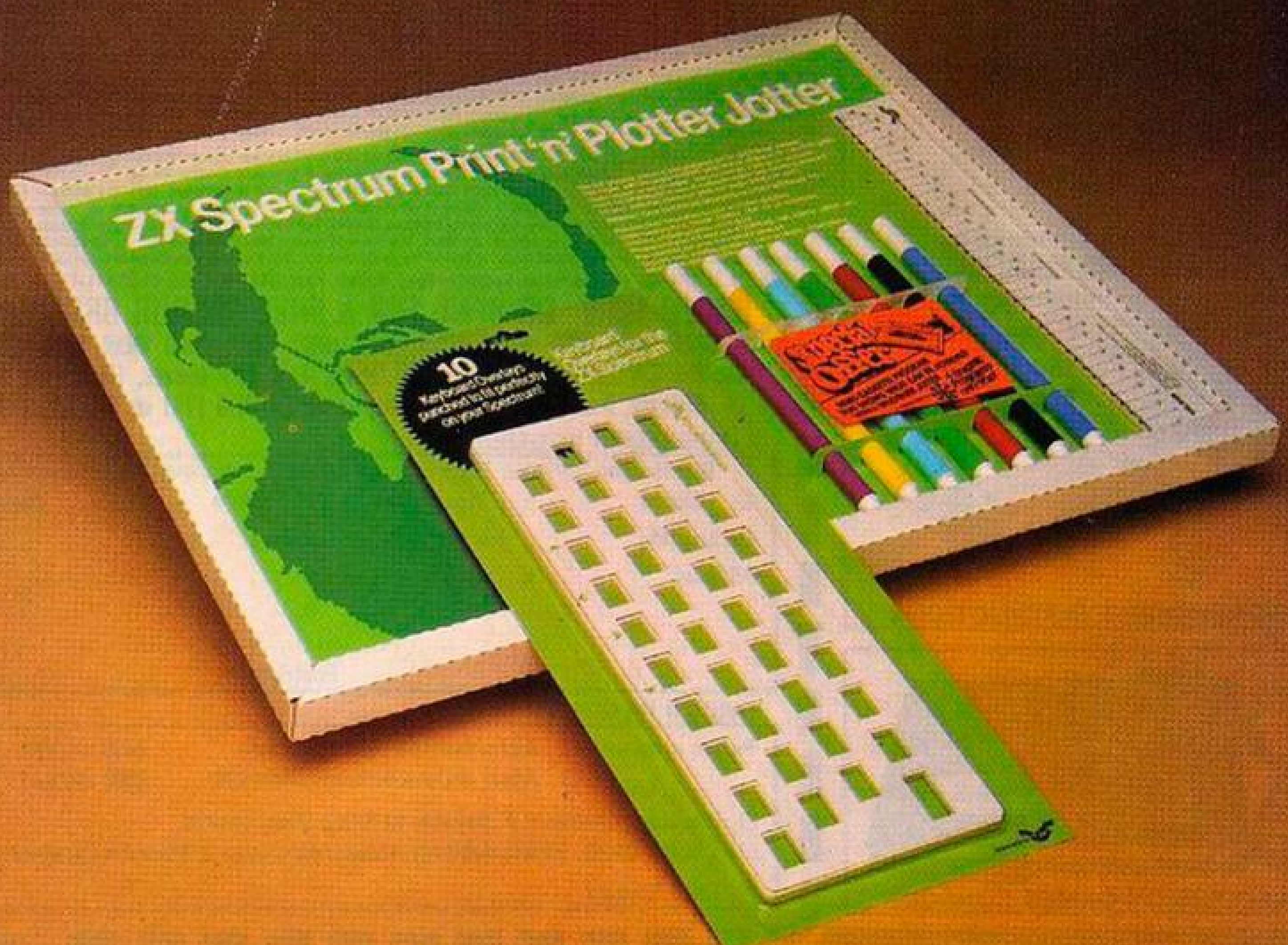
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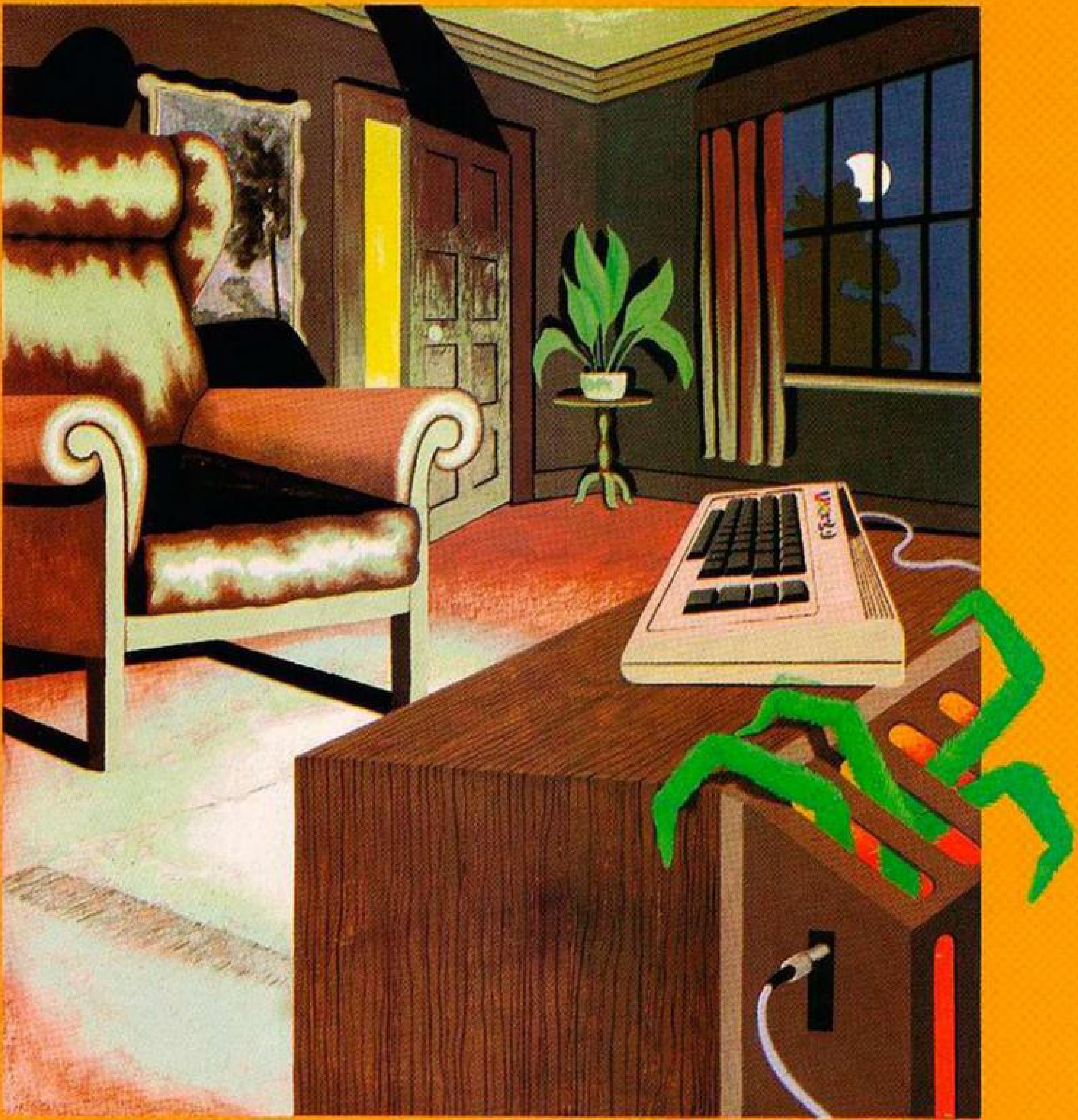
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